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Malnutrition screening in community living older adults: towards better service delivery models

Aliza Haslinda Hamirudin
University of Wollongong

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**MALNUTRITION SCREENING IN COMMUNITY LIVING
OLDER ADULTS: TOWARDS BETTER SERVICE DELIVERY
MODELS**

This thesis is presented as part of the requirements for the
award of the Degree of

DOCTOR OF PHILOSOPHY

of the

UNIVERSITY OF WOLLONGONG

By

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BSc (Hons) Health Sciences, Dietetics

MSc Nutrition

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ABSTRACT

Malnutrition in community living older adults is under recognised and remains a problem; which leads to various adverse effects including recurrent hospital admission. Deterioration of older adults' nutritional status during hospitalisation is well documented and integrated approaches between settings are needed to improve outcomes in this group. Nutrition screening is an initial procedure to identify malnutrition and has been recommended across all health care settings. However, it is not routinely conducted in community living older adults in Australia and is not implemented in Australian General Practice. This thesis has taken a mixed methods approach to evaluate model of nutritional care delivery of community living older adults.

In order to contextualize the progression of nutritional status of older adults following a hospital stay, a sample of Department of Veterans' Affairs (DVA) clients was recruited to a three-month study. Participants were evaluated two weeks post discharge and again at three months, following an individualised home-based dietetic intervention. The purpose of this individualised intervention at home in this group of older adults was to better co-ordinate use of available community resources with the aim of improving their nutritional status post discharge and prevent hospital readmission; and to evaluate the effectiveness of this model of care. Mean body weight increased significantly from 67.1 ± 13.5 kg to 68.0 ± 13.7 kg ($p=0.048$) and mean Mini Nutrition Assessment (MNA[®]) score improved significantly ($p=0.000$). Mean energy, protein and micronutrients intakes were adequate at both baseline and at three months, except for vitamin D. Dietetic intervention improved nutritional status three months after hospital discharge in this group of older adults living in the community.

Next, a three phased participatory action-based research programme was undertaken in General Practices with the results of each informing the next study development. The first study in the general practice setting was undertaken with staff from three participating General Practices in order to identify perceived barriers and opportunities related to the implementation of nutritional screening. Twenty five in-

depth individual interviews were conducted and analysed thematically. Lack of time was identified as the major barrier. Incorporation of a validated short nutritional screening instrument into the existing Medicare Benefit Schedule (MBS) Health Assessment for people aged 75 +years (75+HA) was identified as the most feasible way to encourage uptake of nutrition screening in General Practice while overcoming the time constraints barrier. We conducted a detailed investigation of trends in uptake of the 75+HA by age-eligible Australians over a decade, according to state and identified that less than 20% of older adults had undergone the assessment.

The following study in general practice aimed to demonstrate the feasibility of including a validated nutrition screening tool, the Mini Nutrition Assessment-Short Form (MNA[®]-SF) and accompanying nutrition resource kit for use with older patients attending general practice. Ten doctors and eleven practice nurses from the three participating General Practices attended dietitian-led training sessions on how to perform the MNA[®]-SF. Nutrition screening skills and knowledge of General Practice staff were assessed at baseline and three months after the nutrition screening training. Within a 3 month period, General Practice staff had completed the MNA[®]-SF in 143 patients and identified n= 6 (4.2%) to be malnourished, n= 38 (26.6%) as at risk of malnutrition and the remainder (n= 99 (69.2%)) to be well-nourished. Mean skills and knowledge scores of staff had improved significantly three months after completing the workshop training (p=0.000).

The third and final phase of the nutrition screening study in general practice aimed to evaluate outcomes post nutrition screening between 6 months and one year; and patients' perspectives related to their experiences of undertaking a nutrition screening process and the applicability of the accompanying nutrition resource kit. Of the 143 patients that had been screened at baseline, 72 patients (50.3%) underwent repeat screening. MNA[®]-SF score had improved in those identified as malnourished/at risk at baseline (p= 0.01); while no significant changes were detected for the well-nourished group (p=0.07). Referral to community services predicted malnutrition risk at follow-up (p= 0.031). Interviews indicated that the MNA[®]-SF process itself was well-received but that patients did not perceive themselves as being in need of additional nutrition support.

Implementation of routine identification of malnutrition in older adults attending general practice can be achieved with the incorporation of a rapid screening tool into general practice software. Further deterioration in nutritional status may then be prevented by following appropriate nutrition care pathways.

DEDICATION

To my husband and son, who have experienced this colourful journey with me.

Thank you for your patience and understanding.

You are the reasons for me to keep on battling towards the finishing line.

To my mum, dad, sisters and in-laws.

Thank you for all your support and encouragement.

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To others who have either directly or indirectly had contributed to my PhD journey, my sincere thanks to you.

CERTIFICATION

I, Aliza Haslinda Hamirudin declare that this thesis, submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the School of Medicine, Faculty of Science, Medicine and Health, University of Wollongong, is my own work unless otherwise referenced or acknowledged. This document has not been submitted in whole, or in part, for qualifications at any other academic institution.

Aliza Haslinda Hamirudin

March 2015

PUBLICATIONS

Peer reviewed journal publications in support of this thesis

1. Hamirudin, A. H., Charlton, K., Walton, K., Bonney, A., Albert, G., Hodgkins, A., Potter, J., Milosavljevic, M. & Dalley, A. 'We are all time poor' Is routine nutrition screening of older patients feasible? *Australian Family Physician*. 2013;42:321-6.
2. Hamirudin AH, Ghosh A, Charlton K, Bonney A, Walton K: Trends in uptake of the 75+ health assessment in Australia: A decade of evaluation *Australian Journal of Primary Health* 2014, <http://dx.doi.org/10.1071/PY14074>.
3. Hamirudin, A. H., Charlton, K., Walton, K., Bonney, A., Potter, J., Milosavljevic, M., Hodgkins, A., Albert, G., Ghosh, A. & Dalley, A. Feasibility of implementing routine nutritional screening for older adults in Australian General Practices: A mixed-methods study. *BMC Family Practice*, 2014; 15, 186.
4. Hamirudin AH, Charlton KE, Walton K, Potter J, Milosavljevic M, Albert G, Hodgkins A, Ghosh A, Dalley A, Bonney A. Implementation of nutrition screening for older adults in General Practice: Patient perspectives indicate acceptability *The Journal of Aging Research & Clinical Practice*. Accepted.
5. Hamirudin AH, Charlton KE, Walton K, Carrie A, Tapsell L, Milosavljevic M, Pang G, Potter J, Home-Based Dietetic Intervention Improves the Nutritional Status of Older Adults Post Hospital Discharge: A feasibility study. *Nutrition & Dietetics*. In review.
6. Hamirudin AH, Charlton KE, Walton K. Outcomes Related to Nutrition Screening in Community Living Older Adults: A Systematic Literature Review. *Archives of Gerontology and Geriatrics*. 2015 In press. <http://dx.doi.org/10.1016/j.archger.2015.09.007>

Conference presentations in support of this thesis

1. **16th International Congress of Dietetics, Sydney, Australia, 5-8 September 2012 (oral presentation)**
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Title: ‘*We are all time poor ... but there is opportunity*’: Targeting barriers to routine nutrition screening of older adults in General Practice.
2. **36th Nutrition Society of Australia Annual Scientific Meeting, 27- 30 November 2012 (poster presentation)**
Hamirudin AH, Charlton KE, Walton KL, Bonney A, Potter J, Milosavljevic M, et al. What's on the menu for the 75+ Health Assessment?: An opportunity for nutrition screening of older patients in General Practice. *Australasian Medical Journal (Online)*. 2012;5(12):712.
3. **2013 International Academy Nutrition and Aging (IANA) Meeting, Seoul, Korea, 23 June 2013 (oral presentation)**
Hamirudin A.H, Charlton K, Walton K, Bonney A, Albert G, Hodgkins A, Potter, J., Milosavljevic, M. & Dalley, A. 2013. Towards routine nutrition screening of older patients in Australian General Practice: Participatory research needed to engage practitioners. *The Journal of Frailty & Aging*, 2 (2), 112.
4. **35th ESPEN Congress, Leipzig, Germany, 31 August - 3 September 2013 (poster presentation)**
Hamirudin AH, Carrie A, Charlton K, Walton K, Tapsell L, Milosavljevic M, Pang, G. & Potter, J. Milk And Oral Nutrition Supplements are the Preferred Protein Sources Of Malnourished Older Adults Post Hospitalization. *Clinical Nutrition*. 2013;32, Supplement 1(0):S39-S40.
5. **20th International Congress of Nutrition, Granada, Spain, 15- 20 September 2013 (poster presentation)**
Hamirudin AH, Carrie A, Charlton K, Walton K, L.Tapsell, Milosavljevic M, Pang, G. & Potter, J. Home-Based Dietetic Intervention Improves Nutritional Status Post Hospital Discharge In Older People. *Annals of Nutrition and Metabolism*. 2013;63(1):652.
6. **Dietitians Association of Australia (DAA) 31st National Conference, Brisbane, Australia, 15-17 May 2014 (poster presentation)**
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Feasibility of Mini Nutrition Assessment-Short Form (MNA-SF) and nutrition resource kit in General practice: A qualitative study

- 8. Dietitians Association of Australia (DAA) 32nd National Conference, Perth, Australia, 13 – 16 May 2015 (oral presentation)**
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Feasibility of nutrition screening for older adults in General Practice settings. *Nutrition & Dietetics* 2015; **72** (Suppl. 1): 7

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Implementation of nutrition screening for older adults improves outcomes and well-received by patients in Australian general practice settings

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CHAPTER 1 INTRODUCTION

1.1 Introduction and Aims

In 2012, the proportion of Australians aged 65 years and older was approximately 14% (Australian Bureau of Statistics, 2013a), meaning that one in seven Australians are in this age group (Australian Bureau of Statistics, 2013b). It is estimated that this number will increase to 22% by the year 2016, and to 26% in 2101; whilst the proportion of people below 15 years of age is decreasing; and is expected to be 16% in 2101 (Australian Bureau of Statistics, 2013a).

These demographic shifts indicate that attention should be directed to strategies that will improve the nutritional status of older Australians in order to maintain functionality and independence at home for as long as possible (Department of Health and Ageing, 2012b). In addition, in 2011, a higher proportion of Australian older adults resided in the community compared to approximately 169,000 older adults that lived permanently in residential aged care facilities (Australian Institute of Health and Welfare, 2012). Strategies targeted towards successful and healthy ageing are key priorities for policymakers and government agencies to assist older adults to remain living independently in the community (Department of Health and Ageing, 2012b).

Optimizing nutritional status is an important factor that predicts overall health status (Han et al., 2009); while appropriate dietary intakes from all food groups is needed to meet the nutritional requirements of older adults (Escott-Stump and Mahan, 2004). The role of adequate protein intake is particularly important for tissue repair during periods of convalescence, as well as for maintenance of muscle mass (Bauer et al., 2013). Inadequate intakes of energy, protein and/or other nutrients leads to malnutrition

(White et al., 2012), which subsequently causes negative consequences to health status and quality of life (Dunne, 2008).

Malnutrition is a state of either excessive, or deficient intakes of macronutrients (energy, protein, carbohydrate and fat) and/or other micronutrients which causes a disequilibrium of nutrients in the body (Australian and New Zealand Society for Geriatric Medicine, 2009). Inadequate dietary intakes may occur in older adults due to poor appetite, increased demands during illness and recovery period. Throughout this PhD thesis, the term malnutrition is used in the context of protein energy under nutrition.

Malnutrition arises in the community and contributes to admissions to both hospitals and residential aged care facilities (Russell and Elia, 2010). Twenty years ago, the presence of malnutrition in hospital inpatients was under recognised and resulted in patients being discharged without appropriate nutrition intervention (McWhirter and Pennington, 1994). Unfortunately, this remains a problem in hospital settings today (Tappenden et al., 2013, Volkert et al., 2010) and the risk of malnutrition is even more poorly identified in community settings (Todorovic, 2001, Watterson et al., 2009), where most older adults reside. This contributes to the downward trajectory of health, with noted risk of hospital readmissions and poor health outcomes (Charlton, 2010, Medical Nutrition Institute, 2012a). Risk of hospital readmission (Visvanathan et al., 2003), reduced quality of life (Neumann et al., 2005), inability to perform activities of daily living (Inoue and Kato, 2007, Izawa et al., 2014), risk of additional illness (BAPEN Malnutrition Advisory Group, 2003a) and increased mortality rates are higher amongst malnourished older adults compared to their well-nourished counterparts (Charlton et al., 2012a, Lundin et al., 2012). Other adverse consequences of

malnutrition include more frequent general practitioner visits, increased length of hospital stay and slower recovery after illness (BAPEN Malnutrition Advisory Group, 2003a).

Many factors contribute to malnutrition in the older adult, including age-related physiological changes, multiple chronic diseases and side effects of medications which may subsequently result in inadequate dietary intakes (BAPEN Malnutrition Advisory Group, 2003a, Volkert, 2002). Timely malnutrition identification and management is required as malnutrition is not only a threat to patients' health (Brotherton et al., 2011), but also to healthcare. Healthcare commissions around the world have highlighted the burden of malnutrition in health and social care costs and services; and hence timely malnutrition identification is recommended (Elia et al., 2010). Costs related to malnutrition in Europe are beyond the cost of obesity with approximately 170 billion Euros spent annually for malnutrition, but little attention is given to combat this condition (Medical Nutrition Institute, 2012a). In the UK, the cost of disease-related malnutrition exceeded £7.3 billion in 2003 (Elia, 2009), and was even higher in 2007 with a cost of £13 billion (Elia and Russell, 2009).

Nutrition screening is an initial step to identify malnourished patients, or those at risk of malnutrition, who may benefit from nutrition intervention (Todorovic, 2004, Skates and Anthony, 2012). It generally involves completing a short, validated questionnaire, either with or without anthropometrical measurements, depending on the screening instrument being used. It can be administered in a few minutes by health care professionals including nurses, doctors, general practitioners and dietitians (Todorovic, 2004). Essential characteristics of nutrition screening tools are that they are easy, simple and quick to administer (Bauer et al., 2010). It is also important that the screening

instrument being used has been validated for the population in which it is being applied (Vellas et al., 2006). Green and Watson (2006) identified 21 screening and assessment tools specifically designed for use with older people, each having different characteristics and reference cut-off points. Meanwhile, a systematic literature review has confirmed that the Mini Nutrition Assessment-Short Form (MNA[®]-SF) is the most appropriate nutrition screening tool to identify malnutrition risk in older adults living in the community based on its demonstrated sensitivity and specificity (Phillips et al., 2010). The MNA[®]-SF is a 6-item tool that has been developed and validated from the full Mini Nutrition Assessment, which consists of 18-items (Kaiser et al., 2009).

Expert groups have emphasised the importance of timely nutrition screening for early identification of malnutrition in this high risk group (National Institute for Health and Clinical Excellence, 2006b, Volkert et al., 2006, BAPEN Malnutrition Advisory Group, 2003a, Watterson et al., 2009). However, the identification of malnutrition amongst older adults living at home remains poorly diagnosed and under-recognised in Australia (Watterson et al., 2009).

Elia and colleagues (2005) highlighted the need for nutrition screening programs which include diagnosis, intervention and follow up components. They also stated that problem identification does not result in improved patient outcomes unless accompanied by an effective care pathway to overcome the identified problems. This is also supported by the review of Weekes et al (2009) which provided evidence that screening initiatives alone are not enough to achieve beneficial outcomes. It is therefore imperative that nutrition assessment and intervention is given appropriate attention following nutrition screening.

According to Watterson and colleagues (2009), nutrition assessment is “a comprehensive approach to gathering pertinent data in order to define nutritional status and identify nutrition-related problems.” Meanwhile, nutrition intervention is an essential part of the nutrition care model and is described as “a purposefully planned action(s) designed with the intent of changing a nutrition-related behavior, risk factor, environmental condition, or aspect of health status” (American Dietetic Association, 2008). Older adults may already have multiple health problems, which will usually lead to further complications if appropriate nutrition interventions are not undertaken in a timely manner (Tappenden et al., 2013). The need for a more detailed assessment and care plan following nutrition screening for those who are malnourished, or at risk of malnutrition is essential (Green and Watson, 2006, Stratton, 2007). The American Dietetic Association (2008) has outlined a need for nutrition monitoring and evaluation following nutrition intervention as essential subsequent steps in the nutrition care process.

Multidisciplinary interventions that aim to allow older adults to live independently at home have been shown to reduce the risk of falls, hospitalisation and residential aged care admissions (Beswick et al., 2010). Most studies of nutritional care provision have been conducted in older residents of aged care facilities and hospitalized patients, which reflects a gap in knowledge that is applicable within community settings. Further investigation regarding the outcomes of nutrition interventions following nutrition screening for those with compromised nutritional status residing in the community is thus warranted (Visvanathan et al., 2003, Vedantam et al., 2010).

Kondrup et al (2003) recommend annual screening for free living older people who are aged 65 years and older. This endorsement is also in line with the French National

Authority of Health (2007) which emphasised a need to screen annually. General Practitioners are often recognised as the most appropriate healthcare professionals to initiate screening procedures within the community medical setting (Bauer et al., 2010). Older adults aged 65 years and older have higher encounters than other age groups with general practitioners (Britt et al., 2013a), with an average of eight and sixteen encounters per person during the year 2011-2012 in older adults aged 65-69 and ≥ 85 years, respectively (Valenti et al., 2013). It has been suggested that nutritional screening could be conducted for all newly registered patients in general practice and baseline results could be utilised for future reference (Elia et al., 2005). It has also been suggested that nutritional screening should be included within existing national annual health assessments for older adults aged 75 years and older (Elia et al., 2005, Flanagan et al., 2012, Visvanathan, 2009, Ülger et al., 2010). Nutrition screening is highly recommended to be conducted on those with clinical concerns and repeated at regular intervals, according to the patients' underlying condition (Elia et al., 2005).

Evidence based practice guidelines for the nutritional management of malnutrition in adult patients across the continuum of care were published in December 2009 by the Dietitian's Association of Australia (Watterson et al., 2009). These guidelines recommend routine nutritional screening across all settings (Watterson et al., 2009). However, translation of these guidelines into practice has not yet been demonstrated, especially within the community primary care setting. Targeting positive patient outcomes requires a multidisciplinary approach from health professionals (Volkert, 2002, Tappenden et al., 2013, Jensen et al., 2013). The leading role of the dietitian has been recognised as integral to guide the process of nutrition screening, assessment and subsequent interventions in the community (Rist et al., 2012b); whilst nurses are at the

forefront in performing nutrition screening of older adults in community settings (Skates and Anthony, 2012).

A high prevalence of malnutrition has been documented in Australian hospitals (20-50%) and residential aged care facilities (40-70%) (Watterson et al., 2009). The prevalence of both malnutrition and 'at risk of malnutrition' in Australian older adults living in the community is estimated to be as high as 45% (Rist et al., 2012b, Visvanathan et al., 2003, Cobiac and Syrette, 1995). Malnutrition often originates while older adults are still living at home in the community; which could have been prevented if timely malnutrition identification is implemented (Russell and Elia, 2010). It would be more proactive to screen patients in order to prevent and identify this issue rather than detecting severe problems in malnourished people (BAPEN Malnutrition Advisory Group, 2003b). In Australia, nutrition screening is not routinely conducted in general practice. With a rapidly ageing population there is an urgent need for inexpensive, effective and safe strategies to prevent and treat malnutrition in the community-living older adults. Limited information is available whether it is beneficial or not to screen for malnutrition in this setting; and this gap in the literature has guided the development of this thesis. The use of the most appropriate validated tool nutrition screening tool for community living older adults, the MNA[®]-SF (Kaiser et al., 2009) will be evaluated in the thesis.

1.2 Summary

This PhD research intends to address the gaps in malnutrition issues in community-dwelling older adults through its early identification. Improvements to the current system, by demonstrating the feasibility of routine nutrition screening using MNA[®]-SF in general practices is targeted. New models of nutrition care pathways that include

nutrition interventions (nutrition resource kit, referrals to a dietitian) for those patients that are identified as malnourished or at risk of malnutrition will be developed and pilot tested.

Malnutrition could potentially be reduced, and patients considered to be 'at risk' could be flagged earlier in the community setting if nutrition screening was routinely conducted in general practice. Older people commonly seek initial advice from general practitioners regarding their health problems and nutritional risk can be identified using simple measures (Sampson, 2009). Early identification and intervention are needed in order to prevent further health complications in this high risk group. According to Furman (2006), failure to detect and treat malnutrition in community-living older adults could result in functional and physical impairment which may lead to hospital and long term care admission; or mortality (Todorovic, 2004). Hospitalisation is often the result, with likely longer hospital stays and nutritional status deterioration, as well as resultant increased medical costs for treatment and reduced quality of life (Watterson et.al 2009). In addition, the prevalence of malnutrition in hospital settings and healthcare costs burden could be dramatically reduced if malnutrition is addressed in timely manner whilst older adults are living independently within the community setting.

1.3 Statement of problem

Malnutrition is common among older adults as it is largely under recognised in the community setting and specifically in general practice settings. It is the role of multiple health disciplines to work as a team to combat this through an appropriate model of care that includes nutrition screening and targeted nutrition intervention strategies. The best model of care in the community setting is yet to be determined.

1.4 Hypothesis and Research Questions

Nutrition screening can be conducted in older adults living in the community during visits to their general practitioners, following relevant upskilling of general practice staff. Nutrition screening results in improved clinical pathways to address malnutrition risk.

1. What is the nutritional status and dietary intakes of older adults post hospital discharge, and after 3 months following an individualised home-based dietetics intervention?
2. What are the barriers and opportunities to nutrition screening of older adults in general practice settings?
3. What are the trends in the uptake of the Health Assessment for older people aged 75 years and older (75+ HA)?
4. Are nutrition screening tools and a nutrition resource kit for older adults feasible in general practice settings?
5. What are the patient outcomes following initial nutrition screening and nutrition intervention?

1.5 Aims of the Thesis

To address the outlined statement of problem, the following research aims were formulated:

1. To assess the nutritional status and dietary intakes of older adults post hospital discharge and to assess the effectiveness of a home-based dietetic service.
2. To identify barriers and opportunities to nutrition screening of older adults in general practice settings.

3. To identify trends in the uptake of the Health Assessment for older people aged 75 years and older (75+ HA).
4. To test the feasibility of nutrition screening tools and a nutrition resource kit for older adults in general practice settings.
5. To evaluate patient outcomes following initial nutrition screening and nutrition intervention.

This PhD thesis consists of five separate studies to address the study aims:

Study 1. Determining the nutritional status and dietary intakes (macronutrients and micronutrients, protein food group) by older adults post hospital discharge, and after 3 months following an individualised home-based dietetics intervention.

Study 2. Determining barriers and opportunities to nutrition screening in older adults among general practitioners and practice nurses in general practice settings.

Study 3. Identifying trends in the uptake of the Health Assessment for older people aged 75 years and older (75+ HA).

Study 4. Identifying the feasibility of a validated nutrition screening tool (MNA[®]-SF) and a nutrition resource kit for older adults in general practice settings by conducting the MNA[®]-SF and using a resource kit to facilitate nutrition intervention.

Study 5. Evaluating patients' nutritional status through repeat nutrition screening and intervention, while also assessing patient outcomes by extracting medical record data and interviews with patients.

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CHAPTER 2 SYSTEMATIC LITERATURE REVIEW¹

STATEMENT

This thesis has been prepared in journal article compilation style format for each of the individual chapters that describe the five studies that make up the thesis. This thesis includes chapters that have been submitted for journal article publication and/or already published.

Chapter 2:

Outcomes Related to Nutrition Screening in Community Living Older Adults: A Systematic Literature Review

As the primary supervisor, I Associate Professor Karen Charlton, declare that the greater part of the work in this above article is attributed to the candidate, Aliza Haslinda Hamirudin.

In the manuscript, Aliza contributed to study design, and was primarily responsible for conducting the literature search, sourcing the articles, summarising papers according to eligibility criteria, critically analysing the study outcomes, and for data interpretation and writing the manuscript. The first draft of the manuscript was written by the candidate and Aliza was also responsible for editing according to the suggestions of her co-authors.

Associate Professor Karen Charlton
Primary Supervisor

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2 OUTCOMES RELATED TO NUTRITION SCREENING IN COMMUNITY LIVING OLDER ADULTS: A SYSTEMATIC LITERATURE REVIEW

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Abstract

Introduction

Nutrition screening is an initial procedure in which the risk of malnutrition is identified. The aims of this review were to identify prevalence of malnutrition risk from nutrition screening studies that have used validated nutrition screening tools in community living older adults; and to identify types of nutrition interventions used in the prevalence studies, and identify pathways of care and patient outcomes following screening.

Methods

A systematic literature search was performed for the 20 year period from January 1994 until December 2013 using SCOPUS, CINAHL Plus with Full Text, PubMed and COCHRANE databases as well as a manual search. Inclusion and exclusion criteria were determined for the literature searches and the methodology followed the PRISMA guidelines.

Results

Fifty-four articles were eligible to be included in the review and malnutrition risk varied from 0% to 83%. This large range was influenced by the different tools used and heterogeneity of study samples. Most of the studies were cross sectional and without a subsequent nutrition intervention component. Types of nutrition intervention identified were dietetics intervention, provision of nutrition education, referral to Meals on Wheels services and community services. These interventions helped to improve older adults' nutritional status.

Conclusions

Timely nutrition screening of older adults living in the community, if followed up with appropriate intervention and monitoring, can improve the nutritional status of older adults. This indicates that nutrition intervention should be considered a priority following nutrition screening for malnourished and at risk older adults. Further evaluation of outcomes of nutrition screening and intervention with the use of structured pathways of care is warranted.

Keywords: nutrition screening, malnutrition, community, older adults, nutrition intervention

2.1 Introduction

Older adults are susceptible to malnutrition due to physiological changes, chronic diseases, side effects of medication (Volkert, 2002), loss of appetite (Hickson, 2006), living alone (Hsieh et al., 2010), poor cognition and functional decline (Chen et al., 2009, Johansson et al., 2009). 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) and function, and clinical outcome’ (BAPEN Malnutrition Advisory Group, 2003b). For the purpose of this review, malnutrition refers entirely to under nutrition.

Malnutrition is a silent threat which develops in community settings (Russell and Elia, 2010). McWhirter and Pennington (1994) identified that 40% of older adults were malnourished on hospital admission and subsequently lost more weight during hospital admission. Malnutrition in older adults is highly prevalent in hospital settings around the world (Charlton et al., 2013, Holyday et al., 2012, Kaiser et al., 2010). It is well-documented that malnourished older adults have higher mortality rates than well-nourished peers (Charlton et al., 2012a), greater hospital admissions (Visvanathan et al., 2003), longer hospital stays (Thomas et al., 2007) and experience longer recovery times (BAPEN Malnutrition Advisory Group, 2003a). In the UK, the cost of malnutrition is twice the cost of obesity related medical care (Medical Nutrition Institute, 2012a).

In a large Australian private hospital, only 15% of the 42% malnourished patients identified were referred to a dietitian (Lazarus and Hamlyn, 2005), while an international study reports that nutrition interventions were only available to 14% of malnourished patients during hospitalisation (Cereda et al., 2010). Poor referrals to dietetic services and the low priority assigned to identification of malnutrition by health

personnel in hospital settings has been reported worldwide (Gout et al., 2009, Adams et al., 2008, Mowe et al., 2006). Consequently, there is a high possibility of increasing complications as a result of poor rate of dietetic referral for further nutrition assessment and intervention (Barker et al., 2011). There is a body of evidence that older patients are often discharged from hospital in a compromised nutritional state which will likely contribute to further deterioration when they return to the community (Charlton, 2010).

Nutrition screening has been recognised as an initial step in nutritional care (Mueller et al., 2011). Identification of malnutrition can be performed through nutrition screening which is warranted across all settings and widely emphasised by various expert organisations worldwide (National Institute for Health and Clinical Excellence, 2006b, Volkert et al., 2006, BAPEN Malnutrition Advisory Group, 2003a, Kondrup et al., 2003, Tappenden et al., 2013). Nutrition screening can be summarised as a simple and quick process to identify malnourished or at risk individuals who require nutrition assessment by a dietitian and prioritised nutrition intervention (American Dietetic Association, 1994, Teitelbaum et al., 2005, Kondrup et al., 2003, BAPEN Malnutrition Advisory Group, 2003a, Watterson et al., 2009). Nutrition intervention is defined as ‘a purposefully planned action(s) designed with the intent of changing a nutrition-related behaviour, risk factor, environmental condition, or aspect of health status.’ (American Dietetic Association, 2008).

Green and Watson (2006) identified 21 screening and assessment tools specifically designed for older adults, each with different cut-off points and characteristics. Validity and reliability of the tools are essential criteria (Green and Watson, 2005). However, nutrition screening is poorly performed in community settings and malnutrition remains

under recognised (Watterson et al., 2009). A compromised nutritional state increases frequency of visits to general practitioners (GPs) (BAPEN Malnutrition Advisory Group, 2003a); which ultimately places a burden on primary health care services.

Malnutrition experts in the UK have highlighted the need for further appropriate nutritional care following a screening programme and stated that malnutrition identification does not reflect in outcomes improvement unless accompanied by effective care pathways to address the identified problem (Elia et al., 2005). Timely malnutrition identification and nutrition intervention in older adults whilst they are living in community settings should be a primary goal for healthcare professionals (Rist et al., 2012b).

This review aimed to (1) identify prevalence of malnutrition risk that has been identified from nutrition screening studies that used validated nutrition screening tools in community living older adults; and (2) identify types of nutrition interventions used in the prevalence studies, and identify pathways of care and patient outcomes following screening.

2.2 Methods

Literature searches were performed electronically using SCOPUS, CINAHL Plus with Full Text, PubMed and COCHRANE databases. Searches included peer reviewed journal articles for the 20 year period from January 1994 until December 2013. This is the period during which the majority of nutrition screening studies were conducted and the time period when nutrition screening instruments were being developed and validated for use in older populations. The search was limited to articles in English language and full text articles. Search terms used in the databases are shown in Figure 2-1:

Figure 2-1 Search algorithm used in the review

(“nutrition* risk” OR “malnutrition” OR “undernutrition” OR “nutrition* status”) AND (“elder*” OR “older adult*” OR “older people” OR “senior*” OR “geriatric*” OR “veteran” OR “ageing” OR “aging”) AND (“nutrition* screening” OR “nutrition* risk screen*” OR screen*) AND (“community” OR “home” OR “general practice*” OR “clinic*” OR “primary care”) NOT (“nursing home*” OR hospital)

2.2.1 Inclusion criteria

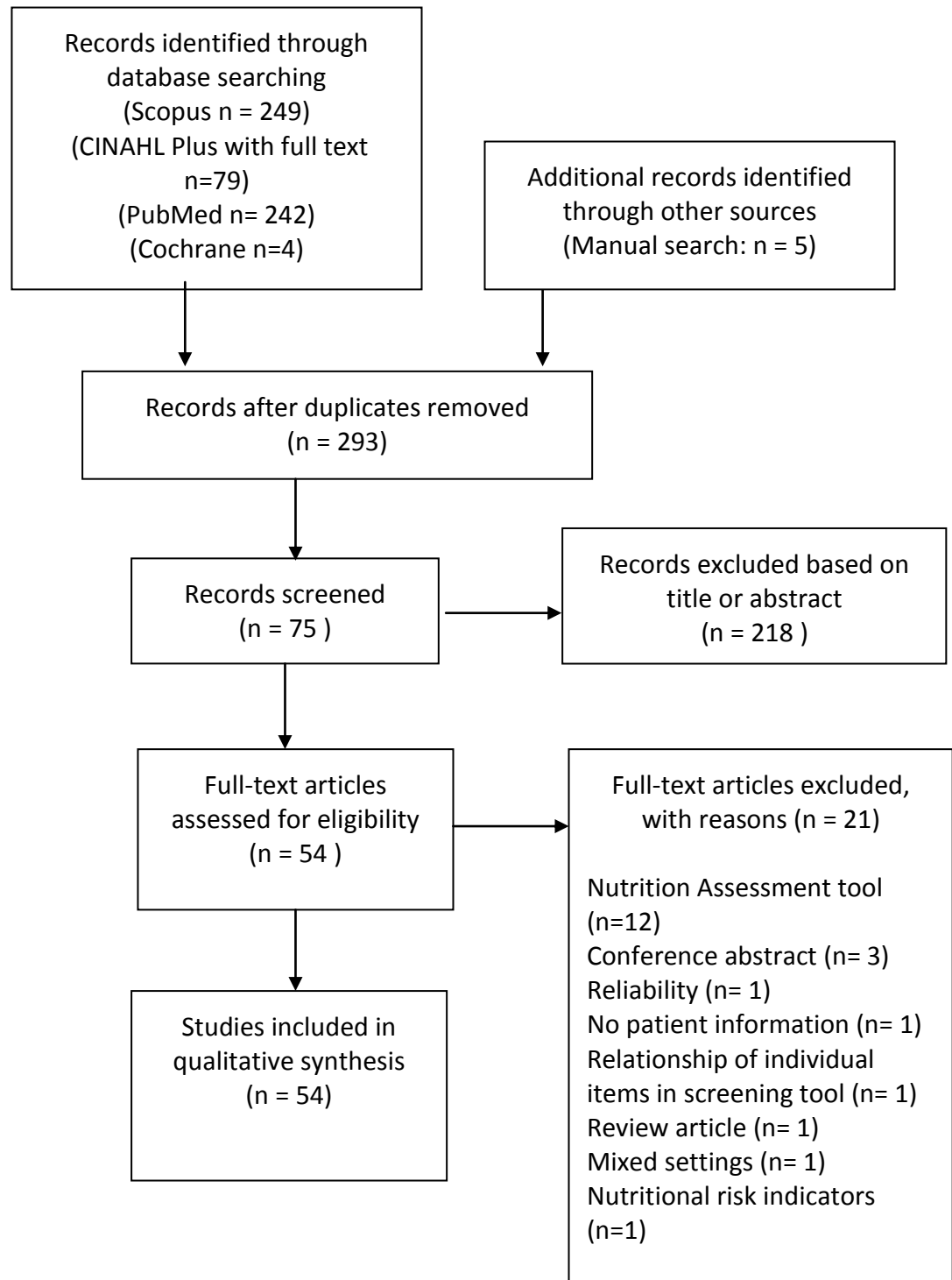
Studies using validated nutrition screening tools for community living older adults, with a mean age of 65 years and above, who were community living and may have had the screening conducted within an outpatient clinic, at home, in a general practice or another primary care setting.

2.2.2 Exclusion criteria

Exclusion criteria included studies of older adults in institutions, nursing home, residential aged care/ care homes, retirement villages and hospital; those with mental illness or impairment or specific diseases or clinical states; comparative studies of nutrition screening tools; studies that assessed validity, inter-rater reliability, evaluation and development of instruments; nutrient or biomarker studies; multiple settings; review articles; cost analyses studies; perception and practices related to screening tools.

Figure 2-2 illustrates the number of journal articles retrieved from the databases. Articles were included for review based on assigned inclusion and exclusion criteria and followed the PRISMA guidelines (Moher et al., 2009). The articles were ranked according to the National Health and Medical Research Council (NHMRC) levels of evidence: I – IV (NHMRC, 2012). Level I is the highest ranking of evidence, whilst level IV is the lowest. Five articles were identified through manual searching. The literature search was performed by AHH. All authors agreed on studies to be included and excluded in this review, based on the pre-defined criteria, and contributed to ranking the evidence and reviewing content of the journal articles. Disagreement to include or exclude any studies was resolved through an iterative process.

Figure 2-2 Journal articles retrieved and selected for review based on PRISMA guidelines



2.3 Results

2.3.1 Nutrition screening tools used in the studies

The identification of malnutrition requires the use of a validated and easily administered nutrition screening tool (Vellas et al., 2006). Instruments that were used in the included studies were the Australian Nutritional Screening Initiative (ANSI), Elderly Nutrition Screening (ENS[®]), Mini Nutritional Assessment-Short Form (MNA[®]-SF), Malnutrition Screening Tool (MST), Malnutrition Universal Screening Tool (MUST), Nutrition Screening Initiative (NSI) (including the DETERMINE Checklist, Level I and II Screen), Nutritional Risk Index (NRI), Nutritional Form For the Elderly (NUFFE), Seniors in the Community: Risk Evaluation for Eating and Nutrition I (SCREEN[®]) and Seniors in the Community: Risk Evaluation for Eating and Nutrition II (SCREEN[®]II). Characteristics of each of the nutrition screening tools are described in Table 2-1.

Table 2-1 Screening tools in alphabetical order, score indicators and pathways of care

| Nutrition screening tools | Characteristics | Risk ranges | Pathways of care |
|--|------------------------|--|--|
| Australian Nutrition Screening Initiative (ANSI) (adapted from NSI) (Lipski, 1996) | - 12 items | - High risk ≥ 6 , Moderate risk 4-5, Good 0-3 | Not available |
| Elderly Nutrition Screening [®] (ENS [®]) (Payette et al., 1995) | - 10 items tool | - Score ≥ 3 shows elevated risk | Not available |
| Mini Nutritional Assessment-Short Form (MNA [®] -SF) (original) (Rubenstein et al., 2001) | -6 items | -At risk ≤ 11 , Well-nourished 12-14 | Proceed with full Mini Nutritional Assessment |
| Mini Nutritional Assessment-Short Form (MNA [®] -SF) (Kaiser et al., 2009) | -6 items | -Malnourished 0 -7 , At risk 8-11, Well-nourished 12-14 | 0-7- Treat 8-11- Treat (weight loss), monitor (no weight loss) 12-14- Rescreen |
| Malnutrition Screening Tool (MST) (Ferguson et al., 1999) | -2 questions | -At risk ≥ 2 -Not a risk: 0 or 1 | 0-1 – Balanced diet, rescreen weekly (acute) or monthly (long term) 2 – Balanced diet, monitor intake and weight 3-5 – high energy and high protein diet, refer to dietitian |
| Malnutrition Universal Screening Tool (MUST) (Elia, 2003) | -5 steps | -Low risk (score=0), medium risk (score =1), high risk (score ≥ 2) | 0 – routine clinical care 1 – observe 2 – treat 0-2 – recheck in 6 months |
| Nutritional Risk Index (NRI) (Wolinsky et al., 1990) | -16 items | -Low to moderate risk: 0-7 -High risk: 8-16 | Not available |
| Nutrition Screening Initiative (NSI) DETERMINE Checklist (White et al., 1992) | - 10 items | - High risk ≥ 6 , Moderate risk 3-5, Good 0-2 | 0-2 -Recheck in 6 months. 3-5 –Search for nutrition information, recheck in 3 months. ≥ 6 –Talk to health professional |

| Nutrition screening tools | Characteristics | Risk ranges | Pathways of care |
|---|---------------------------|---|-------------------------|
| Nutritional Form For the Elderly (NUFFE) (Söderhamn and Söderhamn, 2002) | -15 three-point items | - High risk ≥ 13 , medium risk 6-12, low risk < 6 - Maximum score is 30, higher score shows high risk | Not available |
| Seniors in the Community: Risk Evaluation for Eating and Nutrition questionnaire I (SCREEN [®]) (Keller et al., 2000a) | - 15-item questionnaire | - High risk (score ≤ 45), moderate risk (score= 46-49), low risk (score= 50 -60). | Not available |
| Seniors in the Community: Risk Evaluation for Eating and Nutrition questionnaire II (SCREEN [®] II) (Keller et al., 2005) | - 17-item multiple choice | - High risk (score= 15 -49), moderate risk (score= 50 -53), low risk (score ≥ 54 and 64). | Not available |

The American Nutrition Screening Initiative (NSI) DETERMINE checklist was developed in the United States in the 1990s and has been widely used to identify nutrition risks in older adults (White et al., 1992). SCREEN[®] was adapted in Canada from the DETERMINE (Keller et al., 2007a) and targeted for use in adults aged 50 years and above (Keller et al., 2000b). SCREEN[®] was further developed into SCREEN[®]II. The Australian Nutrition Screening Initiative (ANSI) checklist was another community based tool formulated for older adults aged 65 years and older that was based on the DETERMINE and was widely promoted for use by Australian healthcare practitioners in the 1990s (Lipski, 1996).

In Europe, the NUFFE originated from Sweden for older adults (Söderhamn and Söderhamn, 2002), whilst MUST was developed and widely used in the UK across different settings. The MNA[®] (Guigoz et al., 1996) and its shortened version, MNA[®]-SF (Rubenstein et al., 2001) have been performed worldwide and have been translated into different languages. Meanwhile, the Elderly Nutrition Screening (ENS[®]) tool was developed in Canada for older adults (Payette et al., 1995).

A systematic literature review of nutritional screening tools in community living older adults emphasised that screening tools should be tested for validity and reliability to ensure their sensitivity and specificity (Phillips et al., 2010). The review evaluated validity and reliability of nutrition screening tools used for older adults in the community and reported that the MNA[®]-SF is the most appropriate nutrition screening tool for identification of malnutrition risk in community living older adults (>65 years) because it has demonstrated high sensitivity and specificity (Phillips et al., 2010). The review also reported that MUST and SCREEN[®]II demonstrate good reliability and

validity compared to other identified tools (Phillips et al., 2010). However, the validity and reliability of DETERMINE and SCREEN[®] for use in community living older adults remain inconclusive as cross-validation was not performed (Phillips et al., 2010).

The MNA[®]-SF, which consists of 6 items (Rubenstein et al., 2001) was derived from the 18-item full MNA[®] (Kaiser et al., 2009, Rubenstein et al., 2001). Ease of use and quick screening is highly favourable to ensure wide acceptance among health care personnel. Thus, the MNA[®]-SF is favoured as the most practical instrument (Bauer et al., 2010) as it can be completed in less than 5 minutes (Skates and Anthony, 2012, De La Montana and Miguez, 2011).

2.3.2 Prevalence of malnutrition risk in community living older adults

Studies identifying malnutrition risk in community living older adults indicate a wide nutritional risk range for studies without nutrition intervention (Table 2-2), and in those that were accompanied by an intervention (Table 2-3). This was due to different nutrition screening tools being used and the heterogeneity of study participants. Some of the studies included frail older adults, homebound, older adults receiving home care and very old older adults, which contributed to a higher malnutrition risk as compared to other community living older adults.

All of the studies were observational, either cross sectional (n= 43) (Level IV) or cohort (n=11) (Level III-2), with a duration of up to 5 years. No randomised controlled trials were identified.

2.3.2.1 Nutrition Screening Initiative (NSI)

Twenty-one studies were identified that used the Nutrition Screening Initiative. Eighteen studies used the DETERMINE checklist, whilst another three studies used modified Level I and II screens. There is no standardized scoring algorithm for the original Level I and II screen, thus the modified version scores are based on the DETERMINE checklist (Sharkey and Haines, 2002) and were developed according to the number of undesirable responses for items included in the Level II screen (Ledikwe et al., 2003). Meanwhile, Jensen and colleagues (1997) have reported results for responses obtained using the modified Level I and II items, without a cut-off scoring system. According to the NSI, up to 83% of community-dwelling older adults were at high risk of malnutrition (MacLellan and Van Til, 1998, Yap et al., 2007, Lokken et al., 2002, Sharkey and Haines, 2001, Sharkey et al., 2000, Benedict et al., 1999, Ballard et al., 2013, Weatherspoon et al., 2004, Ledikwe et al., 2003, Marshall et al., 1999, Marshall et al., 2001, Coulston et al., 1996).

Higher malnutrition risks were reported among homebound elderly (Lee and Novielli, 1996), low income older adults (Lokken et al., 2002, Sharkey et al., 2000, Miller et al., 1996) and those living in rural areas (Sharkey and Haines, 2001, Ledikwe et al., 2003), compared to those living in urban areas (Weatherspoon et al., 2004). Poor self-perceived health (Lokken et al., 2002, Weatherspoon et al., 2004, Miller et al., 1996) and functional status (Sharkey et al., 2000, Lee and Novielli, 1996) were also higher in those individuals identified at nutritional risk.

Some of the studies have also focused on nutritional risk indicators from DETERMINE items with polypharmacy (Jensen et al., 1997, Ledikwe et al., 2003, Yap et al., 2007, MacLellan and Van Til, 1998, Marshall et al., 1999), inadequate dairy, fruit and

vegetable intakes (Yap et al., 2007, Miller et al., 1996), dietary modification due to illness (Benedict et al., 1999, MacLellan and Van Til, 1998, Marshall et al., 1999) and eating alone being identified as main contributors to overall rating of nutritional risk (Ledikwe et al., 2003, Benedict et al., 1999, MacLellan and Van Til, 1998, Marshall et al., 1999). Curl and Warren (1997) have identified malnutrition risks factors based on numbers of identified risk items (≥ 2 and ≥ 3 risks). Lokken et al (2002) reported that mean BMI in the high risk and at risk groups are 29 kg/m² and of 26 kg/m², respectively. Meanwhile, a self-reported BMI of >27 kg/m² is one of the most prevalent nutrition risk factors (Ledikwe et al., 2003) and nutritional risk score ≥ 12 is associated with poverty (Sharkey et al., 2000).

2.3.2.2 SCREEN[®]

Six studies were identified that used the SCREEN[®]. Adults younger than 65 years old were included in studies using SCREEN[®] for the purpose of early nutritional risk identification (Keller et al., 2007a). Six Canadian studies had performed nutrition screening using this instrument targeting older adults aged 50 years and above; and had identified a range of 39 -57% for malnutrition risk in participants with a mean age of 65 years (Keller and Hedley, 2002, Keller et al., 2007a, Keller, 2006, Keller, 2004, Keller and Østbye, 2003, Keller et al., 2004). Four of the studies were cohort studies, with the longest duration being 18 months (Keller, 2006, Keller et al., 2007a, Keller and Østbye, 2003, Keller et al., 2004); while the remaining two were cross sectional in design (Keller, 2004, Keller and Hedley, 2002). At 18 months follow up, 75% participants from various nutritional risk categories perceived that their quality of life had deteriorated since baseline, while whole-life satisfaction and good physical health days were lower in the high risk group in the follow up period compared to those in the

other groups (Keller et al., 2004). In addition, mortality rate was 7.4% at follow up and was recorded to be higher in males, those of older age and malnourished participants (Keller and Østbye, 2003). Low nutritional risk was associated with better self-rated quality of life (Keller, 2004) and common nutritional problems that were identified include self-reported significant weight change in 6 months, poor intake of fruits, vegetables and dairy products; and dietary restrictions (Keller and Hedley, 2002).

2.3.2.3 SCREEN[®] II

Eight studies were identified that used the SCREEN[®] II. SCREEN[®] II, is an improved malnutrition risk (Nykänen et al., 2013). version of SCREEN[®] with inclusion of two additional items related to weight and eliminate question on financial status, identified 31-52% of individuals to be at high risk (Ramage-Morin and Garriguet, 2013, Broeska et al., 2013, McElnay et al., 2012, Wham et al., 2011a, Wham et al., 2011c). A prevalence of up to 62% was identified in a combination of at risk and high risk categories (Southgate et al., 2010, Wham et al., 2011c, Watson et al., 2010). Living alone (Ramage-Morin and Garriguet, 2013, McElnay et al., 2012, Wham et al., 2011c), less social support (Ramage-Morin and Garriguet, 2013), depression (Ramage-Morin and Garriguet, 2013), poor self rated health (Wham et al., 2011a), disability (Wham et al., 2011a) and eating alone (Watson et al., 2010, Wham et al., 2011a) were identified factors associated with malnutrition risk. Meanwhile, a higher mortality rate within 5 years is documented in the high nutritional risk group, compared to those in other groups (Broeska et al., 2013). Low nutritional risk was associated with being physically more active, greater muscle mass and muscle strength, and a lower percentage of body fat (Wham et al., 2011c). The SCREEN[®] II may need to be modified when used in different populations from which it was developed. There is some evidence that

different populations interpret items included in the SCREEN[®] II differently, which makes cross-country comparisons difficult (Wham et al., 2011b).

2.3.2.4 Mini Nutritional Assessment-Short Form (MNA-SF[®])

Five studies used the MNA[®]-SF to screen for malnutrition and all of them were cross-sectional in design (Ji et al., 2012, Nykänen et al., 2013, Timpini et al., 2011, Winter et al., 2013, Ülger et al., 2010). Less than 8% of older adults were malnourished and at risk of malnutrition in a sub-urban area in Italy (Timpini et al., 2011). A study in Australian general practice demonstrated one malnourished and 16% at risk older adults aged 75 years and older (Winter et al., 2013). This study also reported that the at risk group had significantly lower mean body mass index (BMI) than their well-nourished peers and that 34% of the at-risk group had BMI ≥ 25 while 13% were identified as underweight. Twenty-eight percent of 2327 community living older adults in Turkey appeared to be at risk of malnutrition (score ≤ 11) in an outpatient geriatric clinic (Ülger et al., 2010). A higher prevalence of being at risk of malnutrition was documented in China (Ji et al., 2012) and Finland (Nykänen et al., 2013), at 70.4% and 94%, respectively. Poor self-rated health, receiving home care and meal services, polypharmacy, symptoms of depression, cognitive impairment, older age, and poor functional status were associated with an increased

2.3.2.5 Nutritional Form For the Elderly (NUFFE)

Four cross sectional studies used the NUFFE. Three studies were conducted in Norway (Dale et al., 2012, Sundsli et al., 2012, Tomstad et al., 2012a) and one in Sweden (Söderhamn et al., 2012). Approximately 80% of older adults were identified as well-nourished according to NUFFE classification (Söderhamn et al., 2012, Tomstad et al.,

2012a). Sundsli et al (2012) found a higher risk amongst adults aged ≥ 85 years with a mean NUFFE score of 6.6 ± 4.1 , which is in the at risk category; whilst the mean score of total participants aged ≥ 65 years was in the low risk category (4.0 ± 3.1). Poorer self-care ability was found in the at risk group and associated with inability to prepare food (Dale et al., 2012). Identified contributors to nutrition risk were receiving assistance for daily living, being inactive, displaying a sense of helplessness and living alone (Tomstad et al., 2012a).

2.3.2.6 Malnutrition Universal Screening Tool (MUST)

Only two studies used the MUST. Two Norwegian cross sectional studies that used the MUST screening tool (Kvamme et al., 2011a, Kvamme et al., 2011b) reported that less than 10% of participants were at risk and/or malnourished (Kvamme et al., 2011a, Kvamme et al., 2011b). Health related quality of life reduced significantly in those considered to be at risk (Kvamme et al., 2011b) and mental health symptoms were significantly associated with nutritional risk (Kvamme et al., 2011a).

2.3.2.7 Elderly Nutrition Screening (ENS[®])

ENS was used in two studies. A prospective cohort study in Canada identified that 60% of free living older people were at moderate to high risk of malnutrition according to ENS classification. Poor self-rated health increased nutrition risk threefold (Roberts et al., 2007). Another Canadian study reported elevated risk in 46.1% men and 55.9% women; with older age being a significant factor contributing to nutrition risk (Ávila-Funes et al., 2008).

2.3.2.8 Australian Nutrition Screening Initiative (ANSI)

Four studies were identified that used the ANSI. Brownie (2007), Burge and Gazibarich (1999), Patterson et al (2002); and Cobiac and Syrette (1995) used ANSI to screen for malnutrition. Approximately 30% were identified at high nutritional risk, whilst the combination of high and moderate nutritional risk is up to 60%. (Burge and Gazibarich, 1999, Patterson et al., 2002, Cobiac and Syrette, 1995, Brownie et al., 2007). ANSI was used as an instrument to identify risk of malnutrition via a national postal survey (Brownie et al., 2007, Patterson et al., 2002) as well as through self-completion (Cobiac and Syrette, 1995). However, Brownie et al (2007) warned that ANSI may overestimate risk of malnutrition as a screening tool and it has since been reported that the ANSI has poor reliability (Phillips et al., 2010).

2.3.2.9 Malnutrition Screening Tool (MST)

Only one study used MST to screen for malnutrition. The Australian study of clients of Home and Community Care (HACC) identified 15% of the sample to be considered to be at nutritional risk (Leggo et al., 2008).

2.3.2.10 Nutritional Risk Index (NRI)

Only one cross sectional study in the USA used the NRI tool. The study identified that 7.5% of older adults were at high risk (Nickols-Richardson et al., 1996). The authors found that older age was a predictor of nutritional risk; and suggested that the low identified risk may be due to frailer individuals having been institutionalised.

2.3.3 Structured pathways of care following screening

Structured pathways of care following nutrition screening are recommended by the MST, MNA[®]-SF and MUST tools according to categories of nutrition status. No structured pathways were identified from other screening tools. The DETERMINE checklist recommends that older adults who are classified as either being at moderate or high risk seek further nutritional advice from their health care professionals. Meanwhile, recommended intervals for repeat screening vary based on nutritional status categories and tools. From these three identified tools, the MNA[®]-SF is the only instrument that was specifically developed for older adults.

2.3.4 Nutrition intervention and outcomes

Most international studies in community settings were cross sectional to determine the prevalence of malnutrition, but many did not include nutrition interventions (Yap et al., 2007). In this review, only eleven of the fifty-four nutrition screening studies were accompanied with nutrition interventions or documented clinical pathways. Meanwhile, no nutrition interventions were available for older adults in nutrition screening studies that used the MNA[®]-SF, NUFFE, MUST, ENS[®] or NRI.

2.3.4.1 Dietetic referral and advice

Eight of the identified studies included dietetic intervention strategies to address malnutrition. Four studies demonstrated that dietetic advice improved older adults' nutritional status (Benedict et al., 1995, Leggo et al., 2008, Keller et al., 2007a, Klein et al., 1997); whilst another four studies did not evaluate outcomes related to dietetic intervention (Burge and Gazibarich, 1999, Herndon, 1995, Watson et al., 2010, Weddle

et al., 1997). A range of 7 to 64% of older adults refused to see a dietitian despite being identified as being at nutritional risk or malnourished (Benedict et al., 1995, Keller et al., 2007a, Leggo et al., 2008, Klein et al., 1997, Herndon, 1995). More than half of older adults who attended dietetic consultations had no concerns about being at nutritional risk (Benedict et al., 1999). Keller et al (2007a) have reported reasons for a decline in referral to dietetic services as being patient denial of risk status, lack of interest, cost of dietetic intervention and lack of intention to introduce changes to diet.

Only one study has highlighted dietetic referrals for nutrition intervention in Australia (Leggo et al., 2008). Leggo et al. (2008) aimed to develop a dietetic referral system among Home and Community Care (HACC) clients through the implementation of nutrition screening using MST. A nutrition assessment tool, the Patient Generated-Subjective Global Assessment (PG-SGA) was further employed to evaluate the extent of malnutrition risk in the study (Leggo et al., 2008). Other successful approaches to improve older adults' nutritional status include group nutrition education, which involved cooking demonstrations and group discussions, as well as telephone counselling (Wunderlich et al., 2011).

2.3.4.2 Nutrition information resources

This review identified that nutrition information resources were made available for older adults in five studies (Wunderlich et al., 2011, Benedict et al., 1995, Keller et al., 2007a, Southgate et al., 2010, Burge and Gazibarich, 1999). Printed materials were most commonly used in order to deliver nutrition information; namely pamphlets, healthy eating booklets and flyers; and a one year subscription to a nutrition newsletter.

2.3.4.3 Meals on Wheels (MOW) or home delivered meal service

Three studies have included MOW or home delivered meals service as an approach for nutrition intervention (Keller, 2006, Keller et al., 2007a, Watson et al., 2010). Meals on Wheels has been shown to be successful intervention strategy in one of the studies through improvement in SCREEN[®] score at 18 months follow up (Keller, 2006). The other two studies did not highlight outcomes of the MOW intervention (Keller et al., 2007a, Watson et al., 2010) .

In this review, ten studies recruited MOW/home delivered meal service clients as study participants (Herndon, 1995, Keller, 2004, Keller, 2006, Keller et al., 2007a, Keller and Østbye, 2003, Sharkey and Haines, 2001, Sharkey et al., 2000, Weatherspoon et al., 2004, Weddle et al., 1997, Wunderlich et al., 2011); whilst one study involved MOW applicants (Coulston et al., 1996). In the USA, 68% of MOW clients were able to maintain their physical function and minimise adverse effects of malnutrition with the help of a MOW service (Herndon, 1995). It was reported that the increased use of MOW service indicates deterioration in nutritional status (Keller, 2006).

2.3.4.4 Community services

The role of community services in nutrition intervention has been identified. Two studies have adopted this strategy. Referral to appropriate support services in the community such as assistance with shopping helped to improve nutritional status in a Canadian study (Keller et al., 2007a); whilst the other study did not mention the specific community services offered to study participants (Klein et al., 1997).

2.3.4.5 Oral nutrition supplements (ONS)

The use of high energy and high protein ONS does not appear to be a frontline nutrition intervention approach in community settings as none of the identified studies adopted this strategy.

2.4 Discussion

This review has identified fifty-four (n=54) nutrition screening studies using validated nutrition screening tools in community living older adults, types of nutrition interventions, pathways of care and patient outcomes following screening. The availability of various nutritional screening tools for malnutrition risk screening and the heterogeneity of study participants contribute to a wide range of reported risk of malnutrition (0- 83%) in community-living older adults. The alarming figures warrant appropriate attention and care by health professionals.

The implementation of routine nutrition screening for community living older adults can help to identify malnutrition risk and improve patient outcomes if accompanied by appropriate and timely nutrition intervention and follow up. Only eleven (n=11) studies in this review went on to provide nutrition intervention for older adults who were identified to be either malnourished or at high nutritional risk. However, some of the studies reported that older adults refused to undergo nutrition intervention although it was offered to them (Klein et al., 1997, Herndon, 1995, Keller et al., 2007a, Leggo et al., 2008). Further evaluation regarding reasons for refusing to see a dietitian and declining to avail themselves of the suggested interventions should be addressed accordingly.

Nevertheless, most screening tools being used in intervention studies do not provide guidelines on the structured intervention pathways following screening for further follow up. Only a study by Leggo and colleagues (2008) conducted nutrition screening in older Australians using the MST, a validated tool with a recommended intervention pathway. Although none of the studies in this review included high energy and high

protein oral nutrition supplementation (ONS) as a nutrition intervention strategy, the recommendation of ONS intake is normally provided by dietitians during individualised dietetic consultations and is a strategy most often used in an inpatient setting. Another systematic literature review reported that dietary consultation, either with or without prescription of ONS, improved body weight in malnourished older adults which suggests that the dietetic consultation itself is key to improving nutritional status (Baldwin and Weekes, 2011). Furthermore, efficacy of ONS for community living older adults remains unclear, as has been reported in a meta-analysis (Milne et al., 2009).

Only seven studies involved nutrition monitoring, whilst a total of eight studies reported outcomes of interventions. The duration of monitoring following an initial nutrition screen varied from 4 weeks (Southgate et al., 2010) to two years (Wunderlich et al., 2011). All studies reported improvements in older adults' nutritional status after they had received different approaches of nutrition intervention strategies, including printed nutrition education resources (Southgate et al., 2010), subscription to a nutrition newsletter and dietary consultation (Benedict et al., 1999), referral to MOW (Keller, 2006, Herndon, 1995); a combination of counselling, nutrition education resources and a home delivery meal program (Wunderlich et al., 2011, Keller et al., 2007a), and individualised dietetic evaluation and consultation (Klein et al., 1997, Herndon, 1995, Leggo et al., 2008). Further evaluation of outcomes of nutrition interventions following nutrition screening for those in a compromised nutritional status living in the community is warranted (Visvanathan et al., 2003, Vedantam et al., 2010).

Most of the studies in this review are cross sectional studies to identify nutritional risk in community living older adults without nutrition intervention. A previous systematic

literature review identified that a nutrition screening initiative alone is not enough to result in beneficial patient outcomes (Weekes et al., 2009). There is a need to conduct prospective cohort studies along with appropriate nutritional interventions as emphasized by Roberts et al (2007), to monitor and evaluate malnutrition risk. Green and Watson (2006) also highlighted the need for a more detailed assessment and care plan following nutrition screening for those who are malnourished, or at risk of malnutrition. No randomised controlled trials using validated nutritional screening tools followed up with appropriate nutrition intervention were identified in this review; as it is considered unethical to have a control group who have been identified as malnourished or at risk with no active intervention.

A nutrition care process and model to further evaluate patients' nutritional status was established by the American Dietetic Association (ADA). This recommends a continuous cycle of nutrition assessment, diagnosis, intervention and monitoring (American Dietetic Association, 2008). There is ample evidence that nutrition intervention is essential and should be addressed accordingly before irreversible nutritional risk takes place (Ülger et al., 2010, Keller et al., 2007a). However, there are challenges regarding patient review in the community setting following discharge from hospital (Beck et al., 2001b). In order to prevent a disconnect between levels of care (tertiary vs primary), a systematic approach is required, as consistent with ADA's recommendation (de van der Schueren et al., 2014). Thus, a need for greater awareness from health care professionals is required for appropriate nutritional care delivery in the community as this is where the majority of the older population resides (Australian Institute of Health and Welfare, 2012).

Implementation of routine nutrition screening in general practice is an ideal strategy for timely malnutrition risk identification and provision of appropriate nutrition interventions and follow up (Flanagan et al., 2012, Hamirudin et al., 2014a). However, reports of nutrition screening initiatives conducted in general practice are uncommon, as confirmed in this review. It is more beneficial to screen patients early in order to prevent and identify this issue rather than detecting severe malnutrition problems later on (BAPEN Malnutrition Advisory Group, 2003b). Adequate community resources are essential for implementation of nutrition screening and intervention (Keller et al., 2007a). The use of a nutrition screening tool can help in increasing nutrition awareness (Southgate et al., 2010). Meanwhile, older adults have identified general practice as the most preferred place to obtain nutrition information (Benedict et al., 1999). Thus, the nutrition screening process presents a window of opportunity for further discussion on nutrition; and identification of malnutrition and related adverse effects (Healy et al., 2014). A real challenge is to deliver a seamless nutritional care process in general practice settings; between general practitioners and other healthcare providers (Ball et al., 2012b). As nutrition screening is not usually performed by dietetic and nutrition specialists (ADA, 2008), nurses have been recognised to play this key role in conducting nutrition screening in the community and across other care settings (Skates and Anthony, 2012).

Healthy ageing and independent living at home are essential targets for older adults (Department of Health and Ageing, 2012b). Malnutrition identification through nutrition screening in the community and nutrition intervention and monitoring are vital as reversing the negative outcomes of malnutrition are far more difficult (Flanagan et al., 2012). Further collaborative work amongst healthcare professionals is important to

assist older adults to live independently at home in their best nutritional status (Australian and New Zealand Society for Geriatric Medicine, 2009).

Limitations of this review include exclusion of non-English journal articles and that it covered for the time period of January 1994 until December 2013 only. However, this review is at the forefront in reporting outcomes following nutrition screening in community living older adults. Further high quality studies are warranted to further confirm beneficial outcomes of nutrition screening accompanied with nutrition intervention, monitoring and evaluation. Appropriate nutrition intervention using structured pathways of care and multi-disciplinary approaches to nutritional care are recommended.

2.5 Conclusions

This systematic literature review has identified a wide range of nutrition screening instruments used in studies of older adults living in the community. This variation on use of tools limits comparisons between the reported prevalence of malnutrition in different populations. Timely identification of malnutrition risk using validated nutrition screening instruments, along with appropriate nutrition interventions and ongoing monitoring, appears to improve the nutritional status of community living older adults. However, the level of evidence is weak. Further evaluation of outcomes related to nutrition screening and appropriate intervention, according to structured pathways of care is warranted.

2.6 Acknowledgement

We would like to thank Cecile Perrin, a librarian from the University of Wollongong for advice on the literature searches.

Table 2-2 Nutrition screening studies in community living older adults without nutrition intervention (presented in alphabetical order of tools and most recent year of studies)

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|---|-------------------------------|--|--|--|--|
| Australian Nutrition Screening Initiative (ANSI)² | | | | | | |
| Brownie et al. (2007) Australia | Community-living | Cross-sectional | 1263 (50.8% male, 49.2% female) Age: 65- 98 | ANSI | -High risk: 36% -Moderate risk: 23% | IV |
| Patterson et al. (2002) Australia | Community-living (Older cohort of the Australian Longitudinal study on Women's Health 1996) | Cross sectional postal survey | 12 939 (all female) Age:70-75 | ANSI | -High-risk: 30% -Moderate risk: 23% | IV |

² ANSI score indicator: High nutritional risk ≥6, Moderate nutritional risk 4-5, Good 0-3

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|---|---|--|--|---|--|
| Cobiac and Syrette (1995) Australia | Community- living (Australian Longitudinal Study of Ageing) | Cross sectional (Self- completed questionnaire) | 1098 (male and female) Age: ≥70 | ANSI | -High risk: 30% -Moderate risk: 20.6% | IV |
| Elderly Nutrition Screening[®] (ENS[®])³ | | | | | | |
| Ávila-Funes et al. (2008) Canada | Community- living | Cross- sectional | 1,755 (48% male, 52% female) Age: 67-84 Mean age: 70 ± 2 | ENS [®] | Elevated risk: - 46.1 % (male) - 55.9% (female) | IV |
| Roberts et al. (2007) Canada | Community- living | Prospecti ve cohort (baseline & at 12 months) | 839 (31.3% male, 68.7% female) Mean age: 79.6 years | ENS [®] | - Elevated risk: 60% (baseline) | III-2 |

³ ENS[®] score indicator: Score ≥3 shows elevated risk.

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|------------------|-----------------|--|--|--|--|
| MNA[®]-SF | | | | | | |
| Winter et al. (2013) Australia | General practice | Cross-sectional | 225 (48% male, 52% female) Age: ≥75 Mean age: 81.3 ±4.3 | MNA [®] -SF (revised) ⁴ | -Malnourished : One patient -At risk: 16% | IV |
| Nykänen et al. (2013) Finland | Community-living | Cross-sectional | 696 (30.6% male, 69.4% female) Mean age: 81± 4.6 | MNA [®] -SF (revised) | - At risk and malnourished (score ≤11): 15% - | IV |
| Ji et al. (2012) China | Community-living | Cross-sectional | 632 (33% male, 67% female) Age: ≥90 Mean age: 94 ± 3 | MNA [®] -SF (revised) | - Mean score: 10.3 ± 1.8 - Malnourished: 5.7% - At risk: 70.4% | IV |

⁴MNA[®]-SF (revised) score indicator: Malnourished 0-7, At risk 8-11, Well-nourished 12-14

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|---|---------------------|--|--|-----------------|--|
| Timpini et al (2011) Italy | Community- living (sub- urban) | Cross- sectional | 698 (41.5% male, 58.5% female) Age: ≥65 Mean age: 75.6 ± 6.4 | MNA [®] -SF (original) ⁵ | - At risk: 8%) | IV |
| Ülger et al. (2010) Turkey | Community living (outpatient clinic) | Cross sectional | 2327 (36.4% male, 63.6% female) Age: ≥ 65 Mean age: 72.14 ± 2.18 | MNA [®] -SF (original) | At risk: 28% | IV |

⁵ MNA[®]-SF (original) score indicator: At risk ≤11, Well-nourished 12-14

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|------------------|-----------------|--|--|---|--|
| Malnutrition Universal Screening Tool (MUST)⁶ | | | | | | |
| Kvamme et al. (2011a) Norway | Community-living | Cross-sectional | 3111 (50.1% male, 49.9% female) Age: 65 -87 Mean age: 71.2(male), 72.0 (female) | Malnutrition Universal Screening Tool (MUST) | - At risk of malnutrition (medium and high risk): 7.1% (5.6% male and 8.6% female). | IV |
| Kvamme et al. (2011b) Norway | Community-living | Cross-sectional | 3,286 (49.7% male, 50.3% female) Age: 65 -87 Mean age: 71.7 ± 5.5 | Malnutrition Universal Screening Tool (MUST) | - At risk of malnutrition (medium and high risk): 5.6% male and 9.6% female | IV |

⁶ MUST score indicator: Low risk (score=0), medium risk (score =1), high risk (score ≥2)

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|---|--------------------|---|--|--|--|
| Nutritional Risk Index⁷ | | | | | | |
| Nickols- Richardson et al (1996) USA | Community- living (good cognition) | Cross sectional | 240 Three age groups: 60-69: n= 79 (32.9%), 41.8% male, 58.2% female 80-89: n=86 (35.8%), 31.4% male, 68.6% female 100+: n=75 (31.3%), 22.7% male, 77.3% female | Nutritional Risk Index | -Mean score: 4.06 ± 2.27 -High risk: 7.5% -Low to moderate risk: 92.5% | IV |

⁷ Nutritional Risk Index score indicator: High risk 8-16, Low to moderate risk 0-7

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|---------------------------------------|-------------------------------|--|---|--|--------------------------------------|
| Nutrition Screening Initiative (NSI)⁸ | | | | | | |
| Ballard et al. (2013) Ireland | Community health centres (urban) | Retrospective cross-sectional | 120 (30.8% male, 69.2% Female) Age: 65-97 Mean age: 79.8 | Nutrition Screening Initiative (DETERMINE Checklist) | - Mean score: 3.55 ± 2.62 - High risk: 20.2% - Moderate risk: Not reported | IV |
| Yap et al. (2007) Singapore | Community -living | Cross-sectional | 2605 Age: 55 -98 Mean age: 66.0±7.7 | Nutrition Screening Initiative (DETERMINE Checklist) | - High risk: 4.6% - Moderate risk: 25.5% | IV |
| Weatherspoon et al. (2004) USA | Congregate meal sites (urban & rural) | Cross-sectional | 324 (25% male, 75% female) Age: >60 (93% aged ≥65) | Nutrition Screening Initiative (Modified DETERMINE Checklist) | -Mean score: 4.45 ± 2.76 -High risk: 31% -Moderate: 46% | IV |

⁸ NSI score indicator: High risk ≥6, Moderately at risk 3-5, Good 0- 2

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|---------------------------------|---------------------|---|---|--|--|
| Ledikwe et al. (2003) USA | Community -living (rural) | Cross- sectional | 179 (45.3% male, 54.7% female) Age: ≥65 Mean age: Male 73.3±5.0 Female 73.5 ± 5.0 | Nutrition Screening Initiative (modified Level II ⁹) (Telephone administered) | -Mean score : 6.3 ± 3 .0 (male) 6.3 ± 3 .0 (female) - | IV |
| Sharkey and Haines (2002) USA | Community -living | Cross- sectional | 152 (40% male, 60% female) Age: 60-95 Mean age: 72.2 ± 7.9 | Nutrition Screening Initiative (modified Level I ¹⁰ and Level II based on DETERMINE checklist). (Telephone administered) | -High risk: 12.6% -Moderate risk: 34.4% | IV |

⁹ Level II: No standardized scoring algorithm for original Level II screen

¹⁰ Level I: No standardized scoring algorithm for original Level I screen

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|--|---------------------|--|--|--|--|
| Lokken et al. (2002) USA | Community -living (low income) | Cross- sectional | 212 (22.6% male, 77.4% female) Age: ≥ 55 | Nutrition Screening Initiative (DETERMINE Checklist) | -High risk: 74% -Moderate risk: 17% | IV |
| Sharkey and Haines (2001) USA | Community -living (rural home delivered meals) | Cross- sectional | 245 (27% male, 73% female) Age: >60 Mean age: 78.9 ± 8.2 | Nutrition Screening Initiative (DETERMINE Checklist) | -High risk: 69.4% - Moderate risk: Not reported | IV |
| Marshall et al. (2001) USA | Community -living | Cross- sectional | 220 (33% male, 67% female) Age: >79 Mean age: 84.7 ± 3.9 | Nutrition Screening Initiative (DETERMINE Checklist) | High risk: 14% Moderate risk: 52% | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|---|---------------------|--|--|--|--|
| Sharkey et al. (2000) USA | Community -living (rural home delivered meals) | Cross- sectional | 245 (27% male, 73% female) Mean age: 79 ± 8.2 | Nutrition Screening Initiative (DETERMINE Checklist) | -High risk: 69.4% - Moderate risk: 27.3% | IV |
| Marshall et al (1999) USA | Community -living (rural) Hispanic & non- Hispanic | Cross sectional | 1006 (44% male, 56% female) Age: ≥65 Mean age: 74.5 | Nutrition Screening Initiative (DETERMINE Checklist) | -Hispanic (male: M, female: F) High risk: 24.3% (19% M, 30% F) Moderate risk: 39% (40% M, 39.5% F) -Non-Hispanic (male: M, female: F) High risk: 16% (14% M, 17% F) Moderate risk: 41.3% (46% M, 37.5% F) | IV |
| MacLellan and Van Til (1998) Canada | Community -living | Cross sectional | 215 (32% male, 68% female) Age: ≥70 Mean age: 74.3 ± 7.7 | Nutrition Screening Initiative (DETERMINE Checklist) | -High risk: 10% -Moderate risk: 27% | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|---|--------------------------------------|---|---|--|--|
| Jensen et al. (1997) USA | Clinic sites (rural) | Cross sectional | 5373 (47% male, 53% female) Mean age: 71 | Nutrition Screening Initiative (Modified Level I and II) | -Most commonly reported screening items: intake of ≥ 3 medications (41%) and inadequate food group intakes than recommended ($> 50\%$). | IV |
| Curl and Warren (1997) USA | Clinic sites (rural) | Retrospecti ve cross sectional | 228 (35% male, 65% female) Median age: 77 | Nutrition Screening Initiative (NSI) (DETERMINE Checklist) | - ≥ 2 Nutritional risk factors: 82% - ≥ 3 nutritional risk factors: 59% | IV |
| Lee and Novielli (1996) USA | Community -living (home visit program for home bound elderly) | Cross sectional | 23 (13% male, 87% female) Age: 58 -93 Mean age: 76 ± 11 | Nutrition Screening Initiative (DETERMINE Checklist) | - Mean score: 7 ± 2 - High risk: 78.3% - Moderate risk: 21.7% | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|--|--------------------|--|--|--|--|
| Miller (1996) USA | Community -living (inner- city) North St. Louis (NSL) & East St. Louis (ESL) | Cross sectional | 416 (NSL: 31% male, 69% female) (ESL: 18% male, 82% female) Mean age: 81.5 ± 6.3 (NSL) 69.4 ± 9.1 (ESL) | Nutrition Screening Initiative (DETERMINE Checklist) | -High risk: 48% (NSL), 66 % (ESL) -Moderate risk: 34% (NSL), 24% (ESL) - | IV |
| Coulston et al (1996) USA | Community -living (MOW applicants) | Cross sectional | 230 (32.2% male, 67.8% female) Mean age: 77.4± 7 | Nutrition Screening Initiative (DETERMINE Checklist) | -High risk: 83% -Moderate: 15% | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|---------------------------------|---------------------|--|--|---|--|
| Nutritional Form For the Elderly (NUFFE)¹¹ | | | | | | |
| Tomstad et al. (2012a) Norway | Community -living | Cross- sectional | 158 (41.8% male, 58.2% female) Age: ≥65 Mean age: 73.2 ± 6.9 years | Nutritional Form For the Elderly (NUFFE) | - Mean score: 3.7 ± 2.6 - High risk: 1.3% - Medium risk: 19% | IV |
| Sundsli et al (2012) Norway | Community -living (urban) | Cross- sectional | 1044 (49.3% male, 50.7% female) Age: ≥65 Mean age: 74.8 ± 7.1 | Nutritional Form For the Elderly (NUFFE) | - Mean score: 4.0 ± 3.1 -Mean score according to age groups: 3.2 ± 2.3 (age 65-74) 4.3 ± 3.3 (age 74- 84) 6.6 ± 4.1 (age 85+) | IV |

¹¹ NUFFE score indicator: High risk ≥13, medium risk 6-12, low risk <6

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|--|--------------------------|--|--|--|--|
| Söderhamn et al. (2012) Sweden | Community -living | Cross- sectional | 1461 (45.2% Male, 54.4% Female) Age: ≥ 75 | Nutritional Form For the Elderly (NUFFE) | - High risk: 1% - Medium risk: 21.3% | IV |
| Dale et al. (2012) Norway | Community -living (rural) | Cross- sectional | 1050 (50.1% male, 49.9% female) Age: ≥ 65 Mean age: 74.3 ± 6.8 | Nutritional Form For the Elderly (NUFFE) | - Meanscore: 3.3 ± 2.3 (higher self-care ability group) - Mean score: 7.1 ± 4.6 (lower self-care ability group) | IV |
| SCREEN^{©12} | | | | | | |
| Keller et al. (2004) Canada | Community- living (23 community service providers) | Cohort (18 months) | 367 (26.4% male, 73.6% female) Mean age: 79.3 ± 7.9 | SCREEN [©] | -Baseline: High risk: 44.4% Moderate risk: 24.3% | III-2 |

¹² SCREEN[©] score indicator: High risk (score ≤ 45), moderate risk (score = 46-49), low risk (score = 50 - 60).

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|--|---|---|---|---|--|
| Keller (2004) Canada | Community- living (frail) | Cross- sectional | 367 (26.4% male, 73.6% female) Mean age: 79.3 ± 7.9 | SCREEN [®] | - Mean score: 45.8 ± 6.6 (range: 24-59) - High risk: 44.4% - Moderate risk: 24.3% | IV |
| Keller and Østbye (2003) Canada | Community- living (23 community service providers) | Cohort (18 months) | 367 (baseline) (26.4% male, 73.6% female) Mean age: 79.3 ± 7.9 | SCREEN [®] (abbreviated) Total score: 48 | -At 18 months follow up: Mean score: 37.2 ± 6.9 (Alive) Mean score: 35.2 ± 7.6 (Deceased) | III-2 |
| Keller and Hedley (2002) Canada | Community- dwelling (seniors recreation centre) | Cross- sectional (mail survey) | 263 (40.7% male, 59.3% female) Mean age: 71.7 ± 8.3 | SCREEN [®] | - Mean score: 49.6 ± 5.7 (all participants) 50.36 (4.95) (male) 49.24 (6.39) (female) - High risk: 23.5% - Moderate and high risk: 56.7% - | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|---|------------------|---------------------------------------|--|---|---|--|
| SCREEN[®] II¹³ | | | | | | |
| Ramage-Morin and Garriguet (2013) Canada | Community-living | Cross-sectional | 15,669 (40.4% male, 59.6% female) Age: ≥65 Mean age: 77 | SCREEN [®] II (abbreviated version, high risk score <38) | -High risk: 34% | IV |
| Broeska et al (2013) Canada | Community-living | Cohort (The Manitoba Follow-Up Study) | 522 (All male) Age: >78 Mean age: 86.8 | SCREEN [®] II | -Mean score; 49.9 ± 6.7 -High risk: 44% -Moderate risk: 24% | III-2 |

¹³ SCREEN[®] II score indicator: High risk (score= 15 -49), moderate risk (score= 50 -53), low risk (score ≥ 54 and 64).

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|--|-----------------|---|---|---|--|
| McElnay et al. (2012) New Zealand | Community-living (Maori and non-Maori) | Cross-sectional | 473 (43.8% male, 49.9% female, 6.3% unspecified) Age: ≥65 Mean age: 74 | SCREEN [®] II | - High risk: 32.8% - Moderate risk: 23.7 % | IV |
| Wham et al. (2011a) New Zealand | Community-living | Cross-sectional | 51 (29% male, 71% female) Age: 80-85 Mean age: 82.4 ± 1.7 | SCREEN [®] II (modified version: High risk score <50, moderate/low risk score 51-64) | - Mean score : 52.2 ± 6.7 - High risk: 31% - Moderate/low risk: 69% | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/mean age in years | Nutrition Screening tool, score indicators | Key Findings | NHMRC ¹ Level of Evidence |
|--|---|---------------------|---|--|---|--|
| Wham et al. (2011b) New Zealand | Community- living (Maori and non- Maori) | Cross- sectional | 108 (44% male, 56% female) Mean age: 76.6 ± 1.8 (Maori) 85.2 ± 0.6 (Non- Maori) | SCREEN [®] II (modified version: High risk score <50, moderate/low risk score 51-64) | -High risk: 52% - Moderate/low risk: 48% | IV |
| Wham et al. (2011c) New Zealand | Community- living | Cross- sectional | 108 (44% male, 56% female) Age: 75 -85 Mean age: 76.6 ± 1.8 (Maori) 85.2 ± 0.6 (Non- Maori) | SCREEN [®] II (modified version: High risk score <50, moderate/low risk score 51-64) | - Mean score: 46.4 ±5.8 (living alone) - Mean score: 50.3 ±5.1(living with others) - High risk: 52% - Moderate/low risk: 48% - | IV |

¹NHMRC level of evidence; I: A systematic review of level II studies, II: A randomised controlled trial, III-1: A pseudorandomised controlled trial(i.e. alternate allocation or some other method), III-2 A comparative study with concurrent controls (Non-randomised, experimental trial, Cohort study, Case-control study, Interrupted time series with a control group), III-3: A comparative study without concurrent controls (Historical control study, Two or more single arm study, Interrupted time series without a parallel control group), IV: Case series with either post-test or pre-test/post-test outcomes.

Table 2-3 Nutrition screening studies in community living older adults accompanied by nutrition intervention (presented in alphabetical order of tools and most recent year of studies)

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/ mean age in years | Nutrition Screening Tool | Nutrition Intervention | Key Findings | NHMRC Level of Evidence |
|---|--|---------------------|--|--|--|--|-------------------------------|
| Australian Nutrition Screening Initiative (ANSI) | | | | | | | |
| Burge and Gazibarich (1999) Australia | Community- living (Senior citizen's centres and groups) | Cross- sectional | 92 (24%, male, 76% female) Age: ≥ 65 Mean age: 75.2 ± 5.8 | Australian Nutrition screening Initiative (ANSI) | Availability of healthy eating flyer with a local dietitian's contact number | <ul style="list-style-type: none"> -High risk: 27% (score of 6 or more) -Moderate risk: 30% (score of 4-5) -Low risk: 43% (score of 0-3) -Most common nutrition risk factors: polypharmacy (47%), eating alone most of the time (45%) and dietary modification due to illness (35%). -Significant positive association between self-rated health and nutritional risk was identified. -Home help was significantly associated with nutrition risk. -Inability to shop, cook, or self-feed were more prevalent among those aged >80. -Emphasising multi-disciplinary team approach to address nutrition risk. | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/ mean age in years | Nutrition Screening Tool | Nutrition Intervention | Key Findings | NHMRC Level of Evidence |
|---|---|--------------------------------------|---|--|--|--|-------------------------------|
| Malnutrition Screening Tool (MST) | | | | | | | |
| Leggo et al. (2008) Australia | Community (HACC eligible clients) | Cross- sectional | 1145 Mean age: 76.5 ± 7.2 years | Modified version of Malnutrition Screening Tool (MST) for nutrition screening, PG- SGA for nutrition assessment | Individualized nutrition counselling for at risk subjects who consented to treatment. | -At risk: 15% -Further research: to inquire clients' refusal to free dietetics' service and finding ways to increase the referral uptake. -82% of clients who received dietetics intervention have improved nutritional status. | IV |
| Nutrition Screening Initiative (NSI) | | | | | | | |
| Wunderlich et al. (2011) USA | Home delivered meals (HDM) and congregate meals (CGM) participants | Longitudin al cohort (2 years) | 355 participants (n=259 CGM, n=96 HDM). Mean age: 74.5 ± 9.5 | Nutrition Screening initiative (Modified DETERMINE checklist- Nutrition Survey Risk Screening) | CGM: regular topical nutrition education and counselling (cooking demo, discussion, and handouts). HDM: Only received the similar handouts and phone counselling. | - Nutrition risk scores improved through provided intervention(nutrition education and counselling): Home-delivered meals from 8.1 to 6.1(p<0.01) Congregate meals from 5.76 to 5.32 (p=0.14) | III-2 |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/ mean age in years | Nutrition Screening Tool | Nutrition Intervention | Key Findings | NHMRC Level of Evidence |
|---|---|----------------------|--|--|---|---|-------------------------------|
| Benedict et al. (1999) USA | Community -living (senior nutrition programs) | Cohort (6 months) | 2037 (36% male, 64% female) Mean age: 74.3 ± 7.7 | Nutrition Screening Initiative (DETERMINE Checklist) | -Screening results and one year subscription of nutrition newsletter (to reduce nutrition risk) were provided to participants. -Screening results were sent to physician if participants' consented. -Dietitian contacted high risk participants in rural area through phone call to arrange for a nutrition counselling. | -High risk: 24% (n = 494) (score of 6 or greater) -Moderate risk: 30% (n = 620) (score of 3 to 5) -Most common nutrition risk factors: polypharmacy eating alone most of the time and dietary modification due to illness. -Only 22% of participants consented their result to be sent to physician. -68 (36%) eligible participants agreed to participate in nutrition counselling. -56% participants attended the nutrition counselling had no concern of malnutrition. -89% rated strongly agree or agree that dietetic intervention improved their nutritional status. -Rural participants at high risk with limited medical support received intensive nutrition intervention. -Multidisciplinary approach should be targeted for this at risk group to educate and improve nutrition awareness. | III-2 |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/ mean age in years | Nutrition Screening Tool | Nutrition Intervention | Key Findings | NHMRC Level of Evidence |
|---|--|-------------------|--|--|--|--|-------------------------|
| Weddle et al. (1997) USA | Community -living (Congregate (C) and home delivered (HD) meals participants) | Cross sectional | 288 congregate meal and 36 home delivered meal participants (22 % male, 78% female) Age: ≥ 70 Mean age: 75.9 ± 8.3 | Nutrition Screening Initiative (Modified Level 1) | -At risk participants were referred to project dietitians. | -Moderate or high malnutrition risk: 68% of 288 congregate and 89% of 36 home delivered meals participants. -150 congregate and 27 home delivered meals participants consented for an in-depth assessment with dietitian to clarify specific needs. -The most frequent needs: nutrition counselling (87% C, 100% HD), drug/nutrient counselling (44% C, 52% HD) and dental issues (24% C, 30% HD). -Nutrition screening and assessment should be coordinated in older adult's nutrition in the community program. | IV |
| Klein et al. (1997) USA | Clinic sites (rural) | Cohort (6 months) | 417 Age: ≥ 65 | Nutrition Screening Initiative (modified Level I and II) | -Dietetic evaluation and intervention, diet counselling; medical evaluation; social and community services -Repeat screening was performed 6 months after intervention. (screening form were mailed to patients to be completed and returned) | -38% had BMI < 22. -Interventions were offered to 68 malnourished patients (male n= 28, mean age: 71; female n=40 mean age: 73). -7% had cancelled/refused intervention. -Follow up was still in progress at the time the article was published. 26% had completed repeat screening. | III-2 |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/ mean age in years | Nutrition Screening Tool | Nutrition Intervention | Key Findings | NHMRC Level of Evidence |
|---|---|---------------------------------|--|--|---|--|-------------------------------|
| Herndon (1995) USA | Community -living (MOW recipients) | Cohort | 245 (29% male, 71% female) Mean age: 79.3 | Nutrition Screening Initiative (DETERMINE Checklist) | 130 clients that scored ≥ 3 agreed for further screening using the NSI Level I Screen. by a dietitian at home (46 declined) | -High risk: 33 % (n = 81) -Moderate: 39% (n = 95) -Low: 28% (n = 68) -77% reported of having functional issues, which required help for shopping. -Inadequate food intake was the reason of poor nutritional status, but not choices. -Nutrition screening and intervention can prevent further deterioration and risk of institutionalisation. | III-2 |
| SCREEN[®] | | | | | | | |
| Keller et al. (2007a) Canada | Community -living | Cohort (Phase 1, 2 and 3) | 1196 Mean age: 74.4 ± 10 years | SCREEN [®] | -All participants were provided with nutrition resources during screening (Phase 1). -Counselling & referral to community services, MOW was offered to at risk participants (score less than 50). -Phase 2: follow up telephone call for at risk participants (2-4 months after | -At risk: 38.9% (n=465) -39% of at risk participants accepted further referrals services (109 referred to dietitian & others to other services). -Reasons for referral decline: denial of at risk status, not interested, believed that they can manage by themselves. -From 59% accepting referral to dietitian, only 44 (40%) turned up during the follow up. -Phase 3: 55% reported improve nutritional status due to screening and intervention; whilst 21% made no modification since screening. -Implementation of screening program requires targeted and adequate resources. | III-2 |

| | | | | | screening) -Phase 3: in-depth interview | | |
|---|--|-----------------------|--|-----------------------------|---|--|-------------------------------|
| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/ mean age in years | Nutrition Screening Tool | Nutrition Intervention | Key Findings | NHMRC Level of Evidence |
| Keller (2006) Canada | Community -living (communit y service agencies e.g MOW) | Cohort (18 months) | 367 (baseline), 263 (completed at follow up) Mean age: 78.7 ± 8.0 | SCREEN [®] | Participation in community meal program | - At follow-up: Mean score: 46.9 ± 5.7 High risk: 41% (Score ≤45) - Scores improved at follow up for the high risk group. - Use of community meal program help in maintaining and improving older adults' nutritional status. -Increased use of community meal program indicates deterioration in nutritional status. | III-2 |
| SCREEN[®] II | | | | | | | |
| Watson et al. (2010) New Zealand | Medical centres and a fall prevention service | Cross- sectional | 152 (37.5% male, 62.5% female) Mean age: 79.5 | SCREEN [®] II | Dietary advice during interview or referral to nutrition- related intervention e.g. HDM | -High nutrition risk: 31% -At risk: 23% -At risk and high risk groups were more likely to live alone and female -Four most frequent risk factors for being 'high risk': unintentional weight change, eating alone, perception of own weight (more or less than actual), and low dairy intake. -Eating alone has poor effect to diet quality. | IV |

| Author, Year, Country | Setting | Study design | Total participants (gender), age range in years/ mean age in years | Nutrition Screening Tool | Nutrition Intervention | Key Findings | NHMRC Level of Evidence |
|---|---|---------------------|--|-----------------------------|---|---|-------------------------------|
| Southgate et al. (2010) Canada | Non-institutional ized older adults at local senior's centre | Cohort (4 weeks) | 61 (36.4% male, 63.6% female) 50% aged >75 | SCREEN [®] II | Group A: Personalized letters and healthy eating booklet Group B: Personalized letters only | -At risk: 62.3% -Group A demonstrated better nutrition knowledge than Group B. -Screening and printed education materials have the potential positive effect to modify risk behaviour and nutrition knowledge. | III-2 |

NHMRC level of evidence; I: A systematic review of level II studies, II: A randomised controlled trial, III-1: A pseudorandomised controlled trial(i.e. alternate allocation or some other method), III-2 A comparative study with concurrent controls (Non-randomised, experimental trial, Cohort study, Case-control study, Interrupted time series with a control group), III-3: A comparative study without concurrent controls (Historical control study, Two or more single arm study, Interrupted time series without a parallel control group), IV: Case series with either post-test or pre-test/post-test outcomes.

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CHAPTER 3 METHODOLOGY

3 METHODOLOGY

Chapter 3 aims to elucidate the research methods that have been used throughout the thesis; which in total consists of five studies. The five studies are presented as separate chapters because they each address separate research questions and have used the most appropriate methodology within the pragmatic and translational nature of the action-based research. This thesis utilised a combination of quantitative and qualitative research methods. A mixed-methods approach can provide a greater understanding in health care services evaluation than using a single method (Wisdom et al., 2012). Studies 1 and 3 adopted quantitative methods. Meanwhile, studies 2, 4 and 5 used a mixed-methods approach; quantitative and qualitative methods.

3.1 Overview of studies

This thesis explored models of nutrition care services for older adults in two community settings, which aimed to improve nutritional care delivery post hospital discharge and in general practice setting.

The first study (Chapter 4) within this thesis was part of a larger study which investigated the nutritional status of older adults post hospital discharge when provided with individualised home-based nutrition interventions by a single dietitian at two time points; 2 weeks after discharge and at 3 months. This study specifically examined a group of older adults, who were clients of the Department of Veterans' Affairs (DVA).

The studies thereafter comprise a three-phase participatory action research project that has been conducted in general practice settings, and involved participation from general practice staff. The three participating general practices were from rural, regional and metropolitan areas within the Illawarra and Shoalhaven regions of New South Wales, Australia. This participatory research required engagement with general practitioners and practice nurses which were integral for development of three of the studies within this thesis. These three research phases contributed to the thesis as study 2 (chapter 5), study 4 (chapter 7) and study 5 (chapter 8). Practice staff input and involvement informed the research designs and protocols in each research phase. In study 5, patients who attended initial nutrition screening conducted in study 4 were invited to participate in follow up screening.

Development of study 3 (Chapter 6) was based on findings obtained in study 2. This study investigated uptake of Health Assessment for older adults aged 75 years and older (75+ HA) in Australian general practice over a decade since its introduction in 1999. The 75+HA has been identified as an opportunity to implement nutrition screening in general practice.

3.2 Conceptual framework of the thesis

Continuous Quality Improvement (CQI) is a core element towards a better service delivery model which was evaluated in this thesis. According to Shortell et al (1998), CQI is ‘a philosophy of continual improvement of the processes associated with providing a good or service that meets or exceeds customer expectations.’ The roles

of multidisciplinary healthcare professionals are integral for CQI to ensure appropriate nutrition service delivery for health care clients (Morin, 2011).

Nutrition screening is an initial step in the identification of malnutrition. However, screening is not meaningful if it is not accompanied by further assessment (if at risk), referral for appropriate interventions and monitoring (Weekes et al., 2009). Nutrition intervention should be implemented according to nutrition screening results (Bauer, 2009). Protocols for malnutrition risk identification and management should be employed by healthcare bodies (Kondrup et al., 2003) and is regarded as a priority for older adults (Hickson, 2006). Thus, nutrition screening should be a routine practice in all health care settings (Elia et al., 2005, Watterson et al., 2009), including general practice settings.

Health Service Evaluation of nutrition service delivery models and malnutrition screening in community was demonstrated in 5 studies within this thesis that integrated with CQI:

Study 1: What is the nutritional status of older adults post hospital discharge?
Does home-based dietetic intervention post hospital discharge improve older adults' nutritional status?

- Aim: To improve model of nutritional care transition between hospital and community settings.

Study 2: What are barriers and opportunities to implementing nutrition screening in general practice?

- Aim: To improve nutritional care delivery in general practice through identification of barriers and opportunities to nutrition screening.

Study 3: What is the uptake of 75+ HA over a decade in Australia?

- Aim: To identify the extent of opportunity of nutrition screening within the 75+ HA

Study 4: Is implementing nutrition screening in general practice feasible?

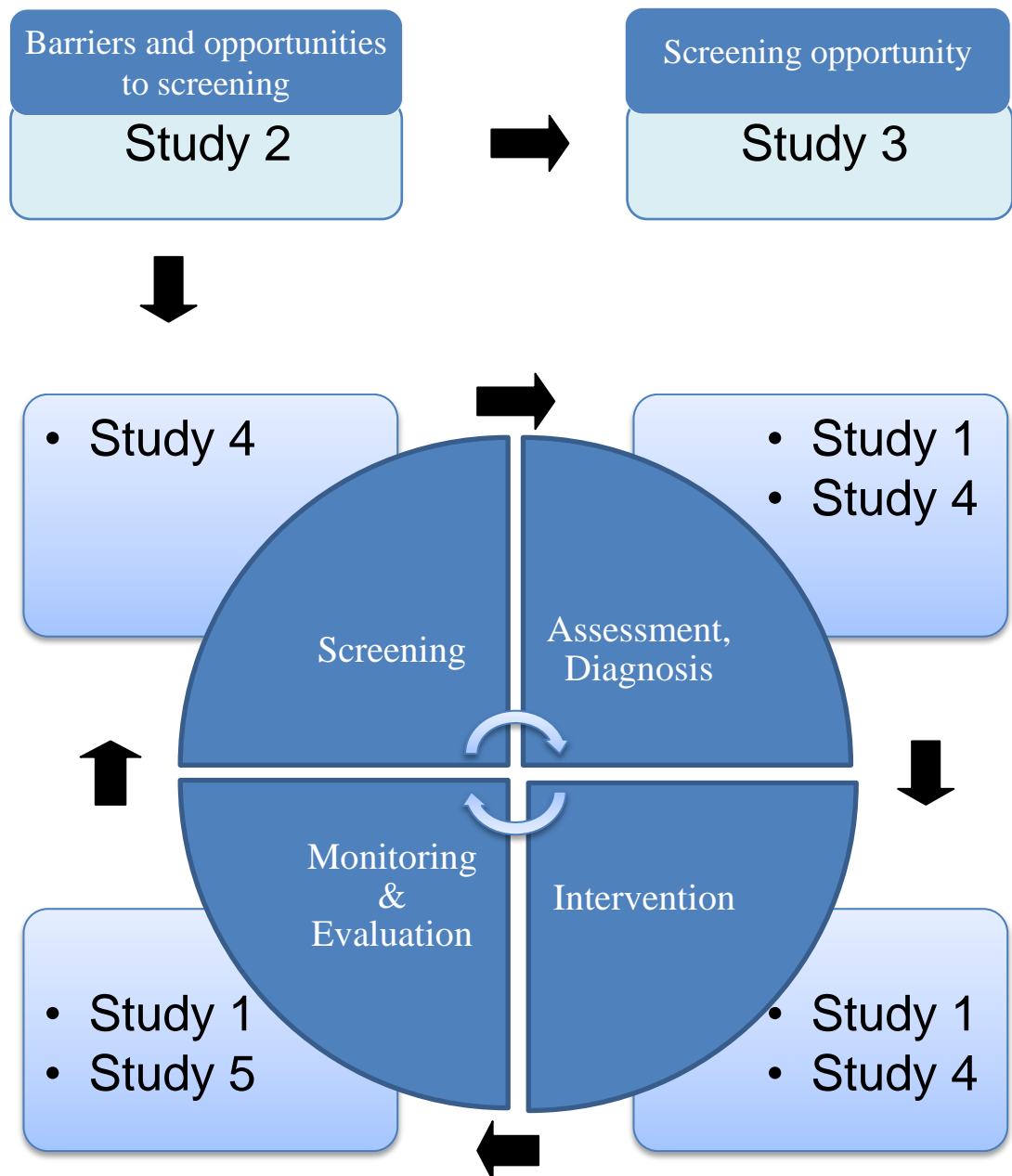
- Aim: To evaluate feasibility of a validated nutrition screening tool, the MNA-SF, accompanied by a locally appropriate nutrition resource kit in general practice.

Study 5: What are the outcomes of nutrition screening in general practice?

- Aim: To evaluate outcomes of nutrition screening process in general practice

Nutrition screening, assessment, intervention, monitoring and evaluation is a continuous process to ensure patients' optimum nutritional status (American Dietetic Association, 2008). This continuous model of nutritional care is emphasised throughout the studies within this thesis. To further describe interrelated theories and concepts, the thesis framework was adapted from American Dietetic Association's (2008) nutrition care process and model which is shown in figure 3-1.

Figure 3-1 Conceptual framework of the thesis



3.3 Study design

The first study conducted in Department of Veterans' Affairs clients is a quasi experimental study in which a home-based dietetic intervention was evaluated. No control group was included due to logistical and ethical considerations; therefore the intervention could not be randomised (pre-post analysis). It was considered unethical to include a control group which would have received no dietetic intervention, as nutritional care should be provided to those in need, particularly once identified as being at nutritional risk or malnourished. Study 3 is a retrospective analysis of cross-sectional studies conducted over a decade, in order to identify uptake of the Medicare-funded 75+ Health Assessment (75+HA). The 75+HA was identified in early exploratory studies as the most feasible option where a nutrition assessment could be placed for this age group. It was thus important to assess uptake of the item over its introduction in the state in which the research was conducted (New South Wales) as well as across other states and nationally. This analysis provides contextual background for recommendations that arise from later studies. Studies 2, 4 and 5 used mixed-method approach to obtain greater understanding of nutritional care delivery service in general practice settings.

3.3.1 Participatory Action Research

The three General Practice-based studies were conducted as participatory action research, which is a qualitative research method (Britten et al., 1995). It is an integrated approach for research design and conduct; which requires active involvement from participants (Cornwall and Jewkes, 1995). Participatory action research actively engages with participants in informing the research process. It is a dynamic approach as collaboration between researchers and participants is a key

element in participatory action research (Cornwall and Jewkes, 1995). Studies 2, 4 and 5 were developed based on engagement with general practitioners and practice nurses. Meetings and feedback sessions regarding planning and findings of each of the studies were scheduled for discussion in each general practice; which subsequently resulted in development of subsequent phases of the research. Involvement of key informants, namely three principal general practitioners from the participating general practices, was central for direction of each study in this setting. Inclusion of the principal general practitioners as research partners is critical to the success of practice-based research, as these individuals are highly knowledgeable about the operation of their general practices, are influential in garnering support for the study and co-operation from within the staff body, and are able to provide insights into feasibility of proposed study designs within day-to-day clinical practice.

3.4 Sampling

Convenience sampling was used in study 1 as all hospitalised DVA clients aged 65 years and older were eligible to participate. The recruitment process was conducted in hospital. Exclusion criteria included being discharged to high level nursing home care, being enterally fed or being terminally ill. Participant information sheets were distributed in hospital and patients who decided to participate completed a consent form prior to discharge. Patients were visited at home by single dietitian for nutrition assessment, intervention, monitoring and evaluation two weeks post discharge and at 3 months.

General practitioners and practice nurses from participating general practices were recruited as participants in study 2 and 4 by convenience sampling technique. Meanwhile, purposive sampling was used to recruit patients for studies in general practice setting. Patients aged 75 years and older were invited to participate in initial nutrition screening in study 4 and nutrition screening follow up in study 5 within 6 months to a year of initial screening.

Study 3 identified the uptake of 75+HA using the Medicare Benefit Schedule (MBS) item number 700 which can be performed in the consulting room while item number 702 is specified for assessment in the patient's home.

3.5 Research methods in health research

3.5.1 Quantitative research methods

This method involved quantitative data collection of patients' dietary intakes, nutritional status and outcomes of nutrition screening. Quantitative data were also obtained from practice staff and general practice; and to identify uptake of 75+HA over a decade.

3.5.1.1 Evaluation of patients' dietary intakes

3.5.1.1.1 Dietary assessment methods

Various dietary assessment methods exist to assess dietary intakes, each with their own unique strengths and limitations (Thompson and Byers, 1994). A combination of diet history and food frequency methods was used to collect information on older adults' dietary intakes post hospital discharge in study 1. The diet history method was chosen to evaluate patients' dietary intakes over other methods of dietary intakes

assessment as it reflects patients' usual dietary intake (Thompson and Byers, 1994, Shim et al., 2014). A trained interviewer is vital in obtaining accurate dietary intakes information from participants (Shim et al., 2014). A food frequency check list served as a cross-checks to the information obtained from diet history (Thompson and Byers, 1994). These two methods are well-recognised for use in prospective cohort studies (Thompson and Byers, 1994), such as study 1.

A 24 hour recall only evaluates dietary intake over the past 24 hours which is not a true reflection of patients' usual intakes and there is risk of bias in recalling foods and beverages consumed (Shim et al., 2014). Although a food diary can be a good alternative as it can provide comprehensive dietary data (Shim et al., 2014), it might be problematic for older adults as this method needs commitments from participants to document their dietary intakes. Older adults recently discharged from hospital might have difficulties to commit to this task due to their health condition. Besides, recording dietary intakes may alter participants' eating pattern in order to demonstrate a good dietary record; and participants may under-report or over-report their dietary intakes in the record (Thompson and Byers, 1994).

The diet history method and food frequency checklist require recall from participants and this is noted as limitation of dietary methods used in study 1. However, strengths of the dietary methods used in this thesis were further complemented as the diet history interviews and food frequency checklist were conducted by a single dietitian. Dietary intakes were documented in a standardised proforma and assessed at home at two time points by the dietitian to avoid risk of bias from a different interviewer. All

dietary intakes data were entered and evaluated using FoodWorks 2009 (Xyris Software, version 6.0) by the PhD candidate.

3.5.1.1.2 Nutritional assessment using the Mini Nutritional Assessment (MNA[®])

Patients' nutritional status was routinely assessed in the ward using the MNA[®]. Nutrition assessment at home was also conducted using the MNA[®]. The MNA[®] was introduced in 1990s for exclusive use in older adults aged 65 years and older (Guigoz et al., 1996). The 18 items of the MNA[®] are made up from four component of assessments: anthropometric, general, dietary and subjective (Guigoz et al., 2002). It can be completed in 15 minutes and can be performed by healthcare professionals across all settings (Bauer et al., 2008). The MNA[®] is widely used around the globe and has been translated into various languages (Bauer et al., 2008). It has been endorsed by the European Society for Clinical Nutrition and Metabolism (ESPEN) as a valid and reliable tool for use in older adults (Kondrup et al., 2003), with 97% predictive value, 98% specificity and 96% sensitivity (Vellas et al., 1999). Furthermore, the MNA[®] is appropriate for use in intervention follow-up studies as health care professionals can identify changes in nutritional risk based on the MNA[®] items and score (Vellas et al., 2006).

In addition, the MNA[®] have been widely used in the Illawarra and Shoalhaven Local Health District hospitals for malnutrition identification in older adults (Charlton et al., 2012a, Charlton et al., 2013); and it has been recognised as an appropriate instrument by local dietitians compared to Subjective Global Assessment (SGA) for use in hospital setting within this region (Barone et al., 2003).

3.5.1.1.3 Nutrition screening using MNA[®]-SF

The nutrition screening tool used in this thesis was the Mini Nutrition Assessment Short form (MNA[®]-SF); a validated and appropriate tool for use with older adults (Phillips et al., 2010). Comparison of ten nutrition screening tools that have been used in community living older adults was undertaken in a systematic literature review to identify validity and reliability of the tools (Phillips et al., 2010). The tools included in the review were: Mini Nutritional Assessment-Short Form (MNA[®]-SF), Seniors in the Community: Risk Evaluation for Eating and Nutrition (SCREEN I and SCREEN II), Nutrition Screening Initiative (NSI) -DETERMINE Checklist and Level I and II Screen, Malnutrition Universal Screening Tool (MUST), Australian Nutritional Screening Initiative (ANSI), Short Nutritional Assessment Questionnaire (SNAQ), Simplified Nutritional Appetite Questionnaire (SNAQ), a Malaysian tool and a South African tool. The suitability of MNA[®]-SF for use in the community setting was confirmed in the review (Phillips et al., 2010). The six MNA[®]-SF items (Rubenstein et al., 2001, Kaiser et al., 2009) were developed from the 18 items of the full Mini Nutrition Assessment (MNA[®]). MNA[®]-SF categorises nutritional status of older adults into three categories: malnourished (score= 0-7), 'at risk of malnutrition' (8-11) and well-nourished (12-14) (Kaiser et al., 2009). It is quick and easy to use (Skates and Anthony, 2012); and can be completed in 5 minutes (De La Montana and Miguez, 2011) which makes it an attractive option for use in busy general practice settings. The MNA[®]-SF is available in a number of different formats, to facilitate convenience in its use; these are paper based, self completed or electronic formats and can be downloaded free of charge at <http://www.mna-elderly.com/> (Nestle Nutrition Institute, 2015).

3.5.1.2 Exploring feedback on nutrition screening in general practice

3.5.1.2.1 Questionnaires

Research questionnaires are a set of questions, either open-ended or closed questions that have been formulated to address research questions (Rowley, 2014). The questionnaire can be distributed by hand, mail or e-mail to potential participants (Rowley, 2014). In study 4, multiple choice questionnaires (MCQs) were used to identify changes in nutrition screening skills and knowledge scores amongst general practice staff. The same MCQs were used pre-training session and after 3 months to assess participants' understanding on nutrition and screening topics, with 4 answer options for each question (n= 11 questions) (Appendix C). The 3 months interval was chosen based on responses from general practice staff in feedback session to inform results of study 2; which was also in line with consensus by research team. The questionnaire was formulated by the research team based on current literature review (Milne et al., 2009) and evidence based practice guidelines (BAPEN Malnutrition Advisory Group, 2003b, Nestle Nutrition, 2011, Nestle Nutrition Institute, 2014a), whilst content and face validity were evaluated with malnutrition experts before being finalised.

The open ended questionnaires were also used in data collection in study 4 as a method to validate interview results from the staff participants. Open ended questions were used to identify participants' perceptions of nutrition screening processes in general practice. The use of a questionnaire method has been proven feasible in general practice setting as demonstrated by an Irish study (Kennelly et al., 2010). Electronic surveys were not included in our studies because a paper based format is considered more feasible and user-friendly for general practice staff.

3.5.1.2.2 Data analysis

Quantitative data analyses were performed using IBM Statistical Package for the Social Sciences (SPSS) statistics software version 19- 21 (SPSS Inc., Chicago, IL, USA). Normally distributed data were analysed using parametric tests; whilst non-parametric tests were performed for not normally distributed data. A two-way ANOVA was used to examine the impact of BMI and gender on daily protein intake, expressed per body weight (g/kg). Binary logistic regression was performed to assess the impact of factors on the likelihood that patients would be identified as malnourished or 'at risk' at follow up. Significant differences were defined as $P < 0.05$. The details for statistical analyses conducted in each study will be discussed in chapters 4, 5, 6, 7 and 8.

3.5.2 Qualitative research methods

Qualitative methods are appropriate to explore new knowledge and information in improving health care services and are widely used in health care research (Tong et al., 2007). Strategies for implementation of nutrition screening in older adults in Australian general practices can be determined through this method as this topic has never been explored and qualitative information can provide a greater understanding of people's experiences (Pope and Mays, 1995). Qualitative methods are particularly informative to better understand any phenomena based on people's experiences and perspectives (Harris et al., 2009). Qualitative approaches in this thesis involved participation from general practice staff, patients themselves and the involvement from research team to facilitate the research process; which has previously been outlined by Britten and colleagues (1995) as an approach for use in general practice.

3.5.2.1 In-depth individual interviews

In-depth individual interviews were conducted with participants to explore their perspectives on particular research topics (Britten et al., 1995). Semi structured interview guides for study 2, 4 and 5 were developed by the single interviewer (PhD candidate), with further questions being asked by the interviewer following prompts received from participants. This type of interview allows the interviewer to explore further information from participants in detail (Britten et al., 1995). All interviews were conducted by the same researcher in the three participating general practices, with answers from earlier interviews informing some lines of questioning for further interviews, via an iterative process.

Interviews were audio recorded by two digital recorders in each interview. The recorded data were transcribed verbatim. Transcripts were subsequently coded into topics for analysis. All interviews were then analysed using thematic analysis and qualitative analysis software, QSR NVivo version 9 (in study 2) or 10 (in study 4 and study 5) were used. Thematic analysis is an approach used which involves identification of topics from the data to determine key themes (Vaismoradi et al., 2013, Gale et al., 2013). An iterative process for topics coding involved constant comparison, whilst emergent themes were identified via topics coding (Pope and Mays, 1995). In qualitative research, key themes and exemplar quotes are integral in reporting findings. The PhD candidate performed the topics coding and primary thematic analyses, whilst secondary analyses were checked by another two research team members. Themes were finalised and verified by the two research team members with the use of member checking process to ensure the validity and reliability of the results and that consensus was reached by the research team.

Quotations selected for reporting were from different participants to demonstrate reliability of the data analysis (Côté and Turgeon, 2005) and the variability of sources of findings (Britten et al., 1995). The validity and reliability of the results were further confirmed by open ended questionnaire (described in 3.5.1.2.1) and triangulation (described in 3.5.2.1.1). Participants were offered to look at their transcripts to check for data accuracy; and they were invited to provide feedback (respondent validation) and comments related to the preliminary analyses (Tong et al., 2007), which is another validation technique used in qualitative research.

Focus groups are another alternative in qualitative research, which involve a moderator and a group of participants (Britten et al., 1995). The moderator introduces a topic to participants to encourage communication and the sharing of experiences. However focus groups were not deemed suitable for use in the general practices due to difficulties in having staff and patients together at similar times; as practice staff schedules are tight and patients come to the general practice for their specific appointment for medical purposes. As the three general practice-based studies were participatory action research, the decision for not including focus group as a research method was based on consultation with the three principal general practitioners and general practice managers from participating general practices. Thus, individual in-depth interview method was chosen as this is the best approach in qualitative method as it allows further exploration of phenomenon and detail information can be obtained (Harris et al., 2009).

3.5.2.1.1 Observation

The observation method requires the researcher to be an instrument for data collection as documentation of what is being observed is key to this method (Mays and Pope, 1995). In study 2, patients were observed in general practice to identify total time involved particularly time spent in consultation room. Observations were conducted so that triangulation could be used to further validate the interview results in study 2.

Triangulation is described as using two or more different methods as a method of validation in qualitative research (Farmer et al., 2006, Harris et al., 2009). The facets that are triangulated in the participatory action research component within this thesis were methods (interviews, questionnaires and observation), investigators (multiple coders/member checking process, feedback sessions to research team) and sources of data (respondent validation; perspectives from general practitioners, practice nurses and patients) (Farmer et al., 2006). Triangulation is conducted in order to increase the validity and reliability of approaches used in qualitative research (Harris et al., 2009).

The majority of the research works within the thesis were conducted by the PhD candidate and contributions of co-authors are described in detail in chapters 2, 4, 5, 6, 7 and 8. Methods are also described in detail within each of the chapters 4- 8.

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CHAPTER 4 (STUDY 1)¹⁴

STATEMENT

This thesis has been prepared in journal article compilation style format. This thesis includes chapter that has been submitted for journal article publication:

Chapter 4:

Home-Based Dietetic Intervention Improves the Nutritional Status of Older Adults Post Hospital Discharge: A feasibility study

As the primary supervisor, I Associate Professor Karen Charlton, declare that the greater part of the work in this above article is attributed to the candidate, Aliza Haslinda Hamirudin.

In the manuscript, Aliza contributed to study design and was primarily responsible for data analysis, data interpretation and writing up the manuscript. The first draft of the manuscript was written by the candidate and Aliza was then responsible for the editing suggestions of her co-authors.

Associate Professor Karen Charlton
Primary Supervisor

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4 HOME-BASED DIETETIC INTERVENTION IMPROVES THE NUTRITIONAL STATUS OF OLDER ADULTS POST HOSPITAL DISCHARGE: A FEASIBILITY STUDY

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Abstract

Background and objectives: In older adults, deterioration of nutritional status during hospital admission, results in many individuals being discharged home at high nutritional risk, with little community-based support. This study aimed to determine if a model of home-based dietetic care improved dietary intake and weight status in a specific group of older adults post hospitalisation.

Methods: Department of Veterans' Affairs (DVA) patients aged ≥ 65 years were recruited from hospitals in a regional area of New South Wales, Australia (n=32 men, n =36 women). Nutritional status was assessed at home at baseline (within 2 weeks post discharge) and 3 months post discharge using a diet history, food frequency checklist and Mini Nutrition Assessment (MNA). Personalised dietary advice was provided by a single dietitian according to participant's nutritional status.

Results: Mean body weight increased significantly from 67.1 ± 13.5 kg to 68.0 ± 13.7 kg (mean change $= +0.97 \pm 3.9$ kg; $p=0.048$). Mean MNA score improved significantly (21.9 ± 3.5 vs 25.2 ± 3.1) ($p<0.001$). Mean energy, protein and micronutrients intakes were adequate at baseline and 3 months, except for vitamin D. At 3 months, the underweight group ($\text{BMI} < 23 \text{ kg/m}^2$) had significantly higher mean protein intake per body weight ($1.7 \pm 0.4 \text{ g/kg}$) compared to those who were a desirable weight ($\text{BMI} 23\text{-}27 \text{ kg/m}^2$) ($1.4 \pm 0.3 \text{ g/kg}$) or overweight ($\text{BMI} > 27 \text{ kg/m}^2$) ($1.1 \pm 0.3 \text{ g/kg}$) peers ($p<0.001$). There was a significant improvement in energy intake contributed from oral nutrition supplements ($+95.5 \pm 388.2 \text{ kJ/day}$) and milk ($+259.6 \pm 659.8 \text{ kJ/day}$), but no changes in other protein sources.

Conclusions: A 3-month in-home dietetic intervention was shown to be feasible and associated with an improved nutritional status after hospital discharge in older adults living in the community. Further well designed studies that include a control group are needed to confirm these findings.

Keywords: malnutrition, older adult, nutrition assessment, nutrition intervention, nutritional status

4.1 Introduction

Malnutrition is common in hospitalised patients around the world especially among older adults. It is estimated that in the Australian hospital setting, approximately 85 % of patients aged 65 years and older who are admitted to acute or rehabilitation hospitals are either malnourished or are at risk of malnutrition(Charlton et al., 2012a, Holyday et al., 2012, Visvanathan et al., 2004b); according to the Mini Nutritional Assessment criteria(Guigoz et al., 1996). Globally, the prevalence in these settings is reported to be 86% (Kaiser et al., 2010).

Deterioration of nutritional status during hospital admission has been demonstrated in older adults, regardless of their nutritional status upon admission (Azad et al., 1999, Persson et al., 2002). The bulk of malnourished patients are discharged home, and experience a greater mortality rate over 12 – 18 months, as compared to their well-nourished counterparts, even taking into account underlying illness and age (Charlton et al., 2013, Charlton et al., 2012a). Over the longer term, mortality rates at 10 years of follow up were twofold higher in older women identified to be ‘at risk of malnutrition’ compared to those that were well-nourished (Lundin et al., 2012). A compromised nutritional status, without adequate support at home is associated with a downward spiral in health that often results in an increased risk of readmission to hospital (Charlton, 2010).

For optimal outcomes, nutrition intervention strategies in high risk groups should be seamless between hospital and home (Thomas et al., 2007). There is a growing body of evidence that home-based dietetic intervention is effective in improving dietary intake, nutritional status and quality of life (Edington et al., 2004, Persson et al.,

2007, Beck et al., 2013). However, in practice, such patients often fall between the cracks during their period of convalescence, a time that may be critical to the prevention of further nutritional decline. Models of care that facilitate smooth transition from hospital to home or residential aged care through improved communication between health service providers, community-based services and family are required. Even in older adults who have access to regular services such as home nursing, malnutrition remains a significant issue (Rist et al., 2012a). This may be the case, for example, with clients of the Department of Veterans' Affairs (DVA).

In Australia, DVA clients have different access to services than other groups of older adults (Department of Veteran's Affairs, 2013). A DVA health card provides unique and specific access to various health care services for DVA clients (Department of Veteran's Affairs, 2014), whilst the remaining of older adults in community have access to health services through Medicare or private health insurance (Department of Human Services, 2014). Department of Veterans Affairs in Canada and the United States also provide exclusive services for veterans through specific schemes (Leftwich Beales and Edes, 2009, Veterans Affairs Canada, 2014, U.S. Department of Veterans Affairs, 2014). Despite having better access to care, it remains to be seen whether additional benefits would be obtained from a home-based dietetic intervention.

This cohort study aimed to determine if a model of home-based dietetic care was feasible to implement, in terms of improving nutritional status and weight in a sample of DVA patients over a 3 month period following hospital discharge. Secondary aims were to investigate whether nutritional status and weight improved in this group, and to identify how changes in food choices over time influenced

macronutrient intake. Further insights into dietary practices and the influence of additional types of nutrition support were simultaneously evaluated. It is hypothesised that the home-based dietetic intervention is associated with an improve nutritional status of older adults post hospital discharge,

4.2 Methods

4.2.1 Subjects

A clinical cohort study was conducted within a regional area of New South Wales, Australia. Eligible participants were those that were clients of the Department of Veteran Affairs (DVA), aged 65 years and older and admitted to hospitals within the Illawarra Shoalhaven Local Health District between December 2010 and December 2011. Exclusion criteria included being discharged to high level nursing home care, being enterally fed or being terminally ill. Patients' nutritional status was routinely assessed in the ward using the 18 item Mini Nutritional Assessment (MNA). The MNA has been specifically developed to identify older adults' nutritional risk status and is a validated tool for this age group (Vellas et al., 1999). Nutritional status was categorised according to three cut-offs for total score ;< 17: malnourished; 17 to 23.5: 'at risk of malnutrition'; and 24 to 30: well-nourished. Prospective participants were provided with a copy of a participant information sheet by ward dietitians and given time to make an informed decision regarding participation. Consenting participants were visited at home by a single dietitian within two weeks of discharge from hospital. A diet history was performed and a food frequency checklist completed. Nutritional status was reassessed using the MNA. This was repeated at three months post discharge by the same dietitian to minimise risk of inter-observer

bias, unless participants had been readmitted to hospital, withdrew or had deceased. Adequacy of dietary intakes was assessed against the age and sex-appropriate estimated average requirement (EAR) or adequate intake (AI), where appropriate (National Health and Medical Research Council, 2006). The key nutrition intervention approach used to enhance patients' nutritional status in this model of care was personalised dietetic advice from the dietitian. Other strategies included to enhance patients' nutritional status in this model of care were individualised prescription of oral nutrition supplements (ONS) and referral to Meals on Wheels (MOW) service. Patients were referred to various community services if appropriate, as per usual practice.

A body mass index (BMI) below 23 kg/m^2 indicates higher risk of mortality in older adults (Winter et al., 2014). In this study, underweight was defined as $\text{BMI} < 23 \text{ kg/m}^2$, desirable weight status was considered as $\text{BMI} 23\text{-}27 \text{ kg/m}^2$; whilst overweight was categorised as $\text{BMI} > 27 \text{ kg/m}^2$.

Dietary intake data was analysed for nutrient assessment using the computerized dietary assessment package FoodWorks 2009 (Xyris Software, version 6.0) using the AUSNUT 2007 database. The contribution of Meals on Wheels (MOW) towards patients' dietary intake was also evaluated. Protein foods were categorized based on AUSNUT 2007 codes.

4.2.2 Statistical Analysis

Differences in weight, BMI, dietary intakes for macro and micronutrients, risk of malnutrition, protein food group and MOW contributions were compared using

paired t-test for normally distributed data and Wilcoxon Signed Rank test for non-parametric data. A two-way ANOVA was used to examine the impact of BMI and gender on daily protein intake, expressed per body weight (g/kg). Missing information and data of participants who did not complete follow up at three months were excluded from analysis. Significant differences were defined as $P < 0.05$. Analyses were performed using IBM SPSS statistics software version 19 (SPSS Inc., Chicago, IL, USA). A power calculation determined that a minimum of 24 participants was required to identify a mean difference of +0.6kg weight gain from baseline assuming power of 0.8 and significance set at 0.05.

Ethics approval was granted by the University of Wollongong Human Research Ethics Committee (HE10/413).

4.3 Results

A convenience sample of 79 participants was recruited, of whom 68 (86.1%) were available at 3-months, 7 of whom had withdrawn from the study and 4 had deceased. According to the MNA classification, those who did not complete the 3 month assessment were either 'at risk' (n=8) or 'malnourished' (n=3) at baseline. Data were analysed for complete information at baseline and at three months follow up.

Mean age was 85.5 ± 5.8 years, with men being slightly older than women ($87.1 (6.3)$ vs $84.0 (5.1)$ years, respectively ($P = 0.028$). Mean body weight increased from 67.1 ± 13.5 kg to 68.0 ± 13.7 kg ($p=0.048$), while mean MNA score improved significantly from being in the 'at risk of malnutrition' category (21.9 ± 3.5) to the 'well-nourished' category (25.2 ± 3.1) ($p<0.001$) (Table 4-1). The total percentage of participants who were identified as 'at risk' and malnourished was 61.8% at baseline, and reduced to 23.5% at 3 months. No significant change was detected for BMI at 3 months. When analysed by gender, MNA score showed significant improvements for both genders ($p=0.000$), but changes in weight and BMI were no longer significant.

At 3 months, a significant difference was identified for mean MNA scores (SD) among the underweight (23.7 ± 3.7), desirable weight (26.5 ± 2.1) and the overweight group (25.8 ± 2.6) ($p = 0.004$). All BMI groups had a mean MNA score in the well-nourished categories (score ≥ 24) except for the underweight group. The post hoc test using Tukey HSD identified significant difference between the underweight and desirable weight groups ($p= 0.003$).

Table 4-1 Anthropometric data and MNA score of study participants

| | Baseline | | 3 months | | P value |
|--------------------------------|----------|------|----------|------|---------------------|
| | Mean | SD | Mean | SD | |
| All participants (n=68) | | | | | |
| Weight (kg)** | 67.1 | 13.5 | 68.0 | 13.7 | 0.048* ¹ |
| BMI (kg/m ²)** | 24.3 | 4.2 | 24.7 | 4.5 | 0.088 ¹ |
| MNA score | 21.9 | 3.5 | 25.2 | 3.1 | 0.000* ¹ |
| Men (n=32) | | | | | |
| Weight (kg) | 71.8 | 14.0 | 72.7 | 13.9 | 0.167 ² |
| BMI (kg/m ²) | 24.0 | 4.3 | 24.3 | 4.3 | 0.281 ² |
| MNA score | 21.5 | 3.3 | 25.5 | 3.0 | 0.000 ^{1*} |
| Women (n=36) | | | | | |
| Weight (kg)*** | 62.7 | 11.6 | 63.8 | 12.3 | 0.074 ¹ |
| BMI (kg/m ²)*** | 24.6 | 4.2 | 25.1 | 4.6 | 0.065 ¹ |
| MNA score*** | 22.3 | 3.6 | 25.0 | 3.3 | 0.000 ^{1*} |

***n = 67 due to unavailable data on weight, ***n = 35 due to unavailable data on weight*

¹ Paired t-test, ² Wilcoxon signed rank test * p value < 0.05

No significant changes were detected in intake of energy and macronutrient distribution after 3 months for all participants (Table 4-2).

Table 4-2 Energy and macronutrient distribution intakes at baseline & 3 months

| Total macronutrient distribution | Baseline | | 3 months | | P value |
|----------------------------------|----------|--------|----------|--------|--------------------|
| | Mean | SD | Mean | SD | |
| All participants (n=68) | | | | | |
| Energy (kJ) | 9366 | 2069 | 9627 | 2389 | 0.358 ¹ |
| Protein (% E) | 17.5 | 2.8 | 17.4 | 2.8 | 0.822 ¹ |
| Total fat (% E) | 32.6 | 5.2 | 33.7 | 6.1 | 0.130 ¹ |
| CHO (% E) | 47.2 | 6.2 | 46.6 | 6.8 | 0.567 ¹ |
| Alcohol (% E) | 1.2 | 3.3 | 0.9 | 1.6 | 0.422 ¹ |
| Men (n=32) | | | | | |
| Energy (kJ) | 10222.8 | 1896.0 | 10588.4 | 2265.0 | 0.391 ¹ |
| Protein (% E) | 17.5 | 2.7 | 17.6 | 2.8 | 0.818 ¹ |
| Total fat (% E) | 32.2 | 5.6 | 33.2 | 4.9 | 0.275 ¹ |
| CHO (% E) | 46.6 | 7.2 | 46.0 | 4.7 | 0.616 ¹ |
| Alcohol (% E) | 2.1 | 4.4 | 1.6 | 2.1 | 0.765 ² |
| Women (n=36) | | | | | |
| Energy (kJ) | 8605.2 | 1935.5 | 8773.0 | 2188.7 | 0.665 ¹ |
| Protein (% E) | 17.4 | 2.9 | 17.1 | 2.8 | 0.526 ¹ |
| Total fat (% E) | 32.9 | 4.9 | 34.1 | 7.0 | 0.287 ¹ |
| CHO (% E) | 47.7 | 5.3 | 47.2 | 8.3 | 0.738 ¹ |
| Alcohol (% E) | 0.4 | 1.5 | 0.3 | 0.7 | 0.889 ² |

¹ Paired t-test, ² Wilcoxon signed rank test, $p < 0.05$

Mean energy, protein and micronutrient intakes were adequate at both time points, with no change over time except for vitamin D which remained below the EAR despite a significant increase at 3 months (Table 4-3). At baseline, energy intake was below EAR among 18.8% (n=6) men and 30.6% (n=11) women participants; while none of the participants had protein intakes (in gram/day) lower than EAR. Vitamin D intake was below the EAR for all participants at baseline except for two women participants. Improvement in Vitamin D intake was related to vitamin D supplementation rather than dietary sources.

At 3 months, a two way ANOVA showed that those who were in the underweight group ($\text{BMI} < 23 \text{ kg/m}^2$) (n = 26, 38.8%) had significantly higher mean protein intakes per body weight (g/kg) ($1.7 \pm 0.4 \text{ g/kg}$) compared to desirable weight (n= 25, 37.3%) ($\text{BMI} 23\text{-}27 \text{ kg/m}^2$) ($1.4 \pm 0.3 \text{ g/kg}$) and overweight participants (n= 16, 23.9%) ($\text{BMI} > 27 \text{ kg/m}^2$) ($1.1 \pm 0.3 \text{ g/kg}$) ($p < 0.001$).

There was a significant improvement in energy intake contributed from oral nutrition supplements (ONS) ($+95.5 \pm 388.2 \text{ kJ/day}$) and milk ($+259.6 \pm 659.8 \text{ kJ/day}$) (Table 4-4), but no changes in other protein sources. The most preferred sources of protein were fish, beef and milk. A total of seven participants (10.3%) were receiving Meals on Wheels at both time points, with 5 participants using a MOW service at both occasions, while 2 participants had discontinued at 3 months and another 2 participants were new MOW clients at 3 months. Use of oral nutritional supplementation increased from 11.8% (n=8) at baseline to 14.7% (n=10).

Table 4-3 Mean energy, protein and micronutrients intake of participants

| Nutrients | All participants (n=68) | | | Men (n=32) | | | | Women (n=36) | | | |
|--------------------------|-------------------------|----------------|---------------------|------------------|------------------|------------|---------------------|-----------------|-----------------|------------|--------------------|
| | Baseline | 3 months | P value | Baseline | 3 months | EAR (>70) | P value | Baseline | 3 months | EAR (>70) | P value |
| Energy (kJ) | 9366 ± 2069 | 9627 ± 2389 | 0.358 ¹ | 10222.8 ± 1896.0 | 10588.4 ± 2265.0 | 8300 | 0.837 ² | 8605.2 ± 1935.5 | 8773.0 ± 2188.7 | 7400 | 0.665 ¹ |
| Protein (g) | 95.2 ± 22.4 | 97.1 ± 23.7 | 0.472 ¹ | 103.9 ± 20.7 | 108.0 ± 22.0 | 65 | 0.317 ¹ | 87.5 ± 21.2 | 87.3 ± 20.9 | 46 | 0.943 ¹ |
| Protein (g/kg body wt)** | 1.5 ± 0.4 | 1.5 ± 0.4 | 0.991 ¹ | 1.5 ± 0.4 | 1.5 ± 0.4 | 0.86 g/kg | 0.531 ¹ | 1.4 ± 0.5 | 1.4 ± 0.4 | 0.75 g/kg | 0.948 ² |
| Water (g) | 2560.8 ± 658.2 | 2530.1 ± 635.9 | 0.693 ¹ | 2664.6 ± 798.5 | 2729.1 ± 746.0 | 3.4 L (AI) | 0.576 ¹ | 2468.4 ± 495.9 | 2353.3 ± 461.4 | 2.8 L (AI) | 0.280 ¹ |
| Dietary-fibre (g) | 31.0 ± 11.2 | 29.3 ± 9.2 | 0.197 ¹ | 33.8 ± 12.2 | 32.2 ± 9.5 | 30 (AI) | 0.513 ¹ | 28.6 ± 9.7 | 26.7 ± 8.2 | 25 (AI) | 0.178 ¹ |
| Thiamine (mg) | 1.9 ± 0.9 | 1.8 ± 0.9 | 0.253 ² | 2.0 ± 1.0 | 2.0 ± 1.1 | 1.0 | 0.667 ² | 1.9 ± 0.9 | 1.7 ± 0.7 | 0.9 | 0.246 ¹ |
| Riboflavin (mg) | 3.0 ± 1.1 | 3.1 ± 1.4 | 0.845 ² | 3.1 ± 1.1 | 3.3 ± 1.7 | 1.3 | 0.852 ² | 2.9 ± 1.1 | 2.8 ± 1.1 | 1.1 | 0.807 ¹ |
| Vitamin C (mg) | 145.8 ± 98.2 | 161.1 ± 163.3 | 0.525 ² | 147.8 ± 81.1 | 172.9 ± 172.8 | 30 | 0.985 ² | 144.0 ± 112.5 | 150.7 ± 156.1 | 30 | 0.354 ² |
| Vitamin D (ug) | 6.4 ± 10.5 | 11.8 ± 23.8 | 0.001 ^{2*} | 5.0 ± 1.7 | 13.2 ± 28.9 | 15 (AI) | 0.004 ^{2*} | 7.6 ± 14.3 | 10.5 ± 18.5 | 15 (AI) | 0.071 ² |
| Folate (ug) | 582.8 ± 289.9 | 570.0 ± 292.8 | 0.153 ² | 567.4 ± 254.6 | 612.6 ± 337.4 | 320 | 0.881 ² | 596.4 ± 321.0 | 532.0 ± 245.3 | 320 | 0.076 ² |
| Magnesium(mg) | 403.0 ± 122.4 | 395.5 ± 104.9 | 0.638 ¹ | 437.1 ± 143.1 | 413.5 ± 99.9 | 350 | 0.525 ² | 372.7 ± 92.5 | 379.5 ± 107.9 | 265 | 0.700 ¹ |
| Calcium (mg) | 1174.0 ± 385.4 | 1246.8 ± 473.4 | 0.169 ¹ | 1203.2 ± 346.4 | 1290.8 ± 442.3 | 1100 | 0.260 ¹ | 1148.0 ± 420.2 | 1207.7 ± 502.4 | 1100 | 0.418 ¹ |
| Iron (mg) | 13.9 ± 4.8 | 13.9 ± 4.5 | 0.755 ² | 15.4 ± 5.6 | 15.4 ± 4.9 | 6.0 | 0.943 ¹ | 12.6 ± 3.6 | 12.5 ± 3.8 | 5.0 | 0.960 ¹ |

**n = 67 due to unavailable data on weight, ¹ Paired t-test, ² Wilcoxon signed rank test * p<0.05

Table 4-4 Main dietary sources contributing to total dietary protein intake, according to food groups and MOW contributions

| Food sources | Energy (kJ/day) | | | Protein | | | | |
|--|-----------------|----------------|---------------------|-----------------------------|---------------------|-----------------------------|---------------------|---------------------|
| | Baseline | 3 months | P value | Baseline | | 3 months | | P value |
| | | | | gram per day (% per day) | Protein exchange | gram per day (% per day) | Protein exchange | |
| Oral nutrition supplement[^] | 57.3 ± 374.5 | 152.8 ± 564.8 | 0.042 ^{1*} | 6.2 ± 10.7 (5%) | - | 16.9 ± 7.7 (23%) | - | 0.02 ^{1*} |
| Egg | 186.6 ± 279.0 | 219.2 ± 286.3 | 0.658 ¹ | 3.9 ± 6.4 (4.1%) | 0.6 | 4.5 ± 6.6 (4.6%) | 0.6 | 0.629 ¹ |
| Fish | 295.2 ± 450.5 | 320.9 ± 434.6 | 0.361 ¹ | 10.0 ± 12.2 (10.5%) | 1.4 | 10.9 ± 12.0 (11.2%) | 1.6 | 0.516 ¹ |
| Beef | 230.7 ± 188.6 | 194.2 ± 138.2 | 0.115 ¹ | 8.8 ± 6.9 (9.2%) | 1.3 | 7.3 ± 5.0 (7.5%) | 1.1 | 0.109 ¹ |
| Lamb | 194.2 ± 123.7 | 173.3 ± 129.9 | 0.279 ¹ | 5.4 ± 3.2 (5.7%) | 0.8 | 4.7 ± 3.6 (4.8%) | 0.7 | 0.422 ¹ |
| Pork | 169.6 ± 113.4 | 136.8 ± 88.0 | 0.508 ¹ | 5.7 ± 3.5 (6.0%) | 0.8 | 5.1 ± 2.8 (5.3%) | 0.7 | 0.575 ¹ |
| Milk | 818.5 ± 490.2 | 1078.1 ± 715.2 | 0.004 ^{1*} | 12.8 ± 7.9 (13.4%) | 1.6 | 14.8 ± 9.2 (15.2%) | 1.9 | 0.024 ^{1*} |
| MOW | 1187.4 ± 596.8 | 1166.7 ± 523.3 | 0.924 ² | 18.6 ± 6.1 (19.5%) | 2.7 | 18.8 ± 7.7 (19.4%) | 2.7 | 0.978 ² |

¹ Wilcoxon signed rank test, ² Paired t-test, *p value <0.05

[^] Oral nutrition supplement brands: Ensure, Sustagen

1 exchange for egg, fish, beef, lamb, pork and MOW = 7 gram protein, 1 exchange for milk = 8 gram protein

4.4 Discussion

An in-home, post discharge nutrition intervention that included dietetic home visits resulted in improvements in the nutritional status of older DVA patients after three months, although these patients already have unique access to clinical and social services. The use of MNA is appropriate compared to other instrument for malnutrition identification in hospital within this region (Barone et al., 2003); as changes in nutritional status can be tracked in the nutritional intervention follow-up. Our findings are also consistent with those from a Danish study that provided a similar intervention (Beck et al., 2013) and another study that provided dietetic home visits with tailored individual dietary advice over a period of 6 months after hospital discharge (Feldblum et al., 2011). The latter study highlighted effectiveness of dietetic home visits compared to the control group which provided usual care and in-patient dietetic intervention before discharge. Nutritional intervention should therefore be a primary goal for the management of malnutrition (Keller et al., 2007b). Early attention to improving oral intake when patients go home to convalesce may prevent further decline in their already compromised nutritional status (Ülger et al., 2010).

A high protein, high energy diet is fundamental to improve the nutritional status of malnourished older adults post hospitalization. Dietary intakes based on estimated average requirement (EAR) is targeted to assess intakes of macronutrients and micronutrients in a group of people (National Health and Medical Research Council, 2006). Surprisingly, although 61.8%% of participants were classified as malnourished or at risk after hospital discharge, mean dietary energy intakes in this study exceeded age- appropriate recommended intakes. Recommended kilojoule

intake for older people aged 65 years and older based on physical activity level of 1.6 is around 7400 kJ/day and 8300 kJ/day for women and men, respectively (National Health and Medical Research Council, 2006). Energy intakes above the EAR have also been reported in the Australian Longitudinal Study of Ageing that included 1000 community-dwelling older adults aged 70 years and older; although 50% of them were identified in moderate and high risk categories, according to Australian Nutrition Screening Initiative tool classification (Cobiac and Syrette, 1995). The study also demonstrated that dietary intake of Australian older adults met most macro and micronutrients requirements (Cobiac and Syrette, 1995), which is consistent with our findings except for vitamin D. Inadequate vitamin D intake in older adults has also been reported by others (Volkert et al., 2004, Carrière et al., 2007). It is not possible to identify the cause of low vitamin D intake in the present study, but improved intake was identified among older adults who consume vitamin D supplementation. Vitamin D supplementation is considered as an intervention strategy to improve older adults' vitamin D intake; as lower intake contributes to loss of muscle mass and an increased risk of falls (Neelemaat et al., 2012).

Adequate protein intake in older adults is particularly important during the recovery process after episodes of illness in order to prevent further loss of muscle mass and improve functionality (Neelemaat et al., 2011). Dietary protein intakes were more than adequate in our sample; however participants who were underweight at follow up had improved intakes of protein per kilogram body weight. This demonstrates that our nutritional intervention strategy achieved appropriate protein intake in those most in need. The recommended level for protein intake of 0.8 g/kg day, regardless of age, has been questioned (Wolfe et al., 2008, Vellas et al., 1999). Recent consensus

guidelines on protein intake in old age recommended by the PROT-AGE study group indicate an average daily intake in the range of at least 1.0 to 1.2 g protein/kg/day in order to maintain and/or regain lean body mass, and 2.0 g/kg/day for overtly malnourished older adults (Bauer et al., 2013). For those with chronic illness, the recommended protein intake is up to 1.5 g/kg/day or equivalent to 15-20% of total energy intake (% E) (Wolfe et al., 2008, Bauer et al., 2013). The present study achieved these higher intakes. A study of older women has demonstrated that a protein intake of between 1.2-1.76 g/kg/day resulted in less health issues than in women with intakes of <0.8 g/kg/day (Vellas et al., 1997). Healthy body weight through desirable BMI status is an indicator for positive health outcomes of adults. This was confirmed in a recent meta-analysis that demonstrated an increased mortality risk in older adults with a BMI < 23 kg/m², but not in the overweight group with BMI > 27 kg/m² (Winter et al., 2014). However, the use of BMI in older adults as the only indicator of nutrition risk should be used with caution as overweight older adults were also at risk of malnutrition according to MNA classification as reported by others (Winter et al., 2013). However, this is not the case in the present study as both the overweight and desirable weight groups have a mean MNA score in the well-nourished category; while the underweight group is in the at risk category.

Preventing weight loss through provision of additional energy and protein using oral nutrition supplements is an effective strategy in older adults who have difficulties in achieving adequate food intake (BAPEN Malnutrition Advisory Group, 2003b). Our study participants had an increased intake of high protein beverages, as demonstrated by their significant changes in intake of milk and oral nutrition supplements (ONS). It is unclear whether this reflects a preference for these foods or

whether it results from dietary advice provided. This may also reflect the convenience of using these ready-to-consume beverages, rather having to prepare meals themselves. A USA study identified that 81% of older adults have difficulties in meal preparation post hospital discharge and that 40% of this group experienced a poor or fair appetite (Anyanwu et al., 2011). Older adults who have an empty fridge have been shown to have a threefold increased risk of hospital admission compared to those with access to adequate food at home (Boumendjel et al., 2000). According to recorded baseline diet histories, participants had already started consuming ONS prior to the first home visit by the dietitian. A meta-analysis has shown that oral nutrition supplementation helps malnourished older adults to gain weight in hospital and institutional care, but not in community setting (Milne et al., 2009). However, the impact of its continued use between hospital and home in the early discharge period is unclear in the meta-analysis. A home-based trial that prescribed a daily intake of 500 kcal/day of high energy and high protein oral nutrition supplements for two months post hospitalisation identified weight increment and improved MNA score among the at risk group (Gazzotti et al., 2003) which are consistent with our findings; whilst another home-based study also reported significant weight gain post intervention.(Beck et al., 2013)

Another strategy to enhance dietary intake is the Meals on Wheels (MOW) service, a home delivery meal service in Australia. Community based meal services such as these offer an alternative form of convenient prepared meals (Krassie et al., 2000), delivered at a reasonable cost. MOW services have been shown to be effective in improving older adults' nutritional status; and offering a good alternative for older adults who have limited ability to cook and prepare meals (Keller, 2006). Charlton et

al reported increased energy and protein intake as well as an improved MNA score with MOW clients after four weeks of receiving nutrient dense snacks provided through the existing service(Charlton et al., 2012b). In the present study, meals provided by the MOW service made a significant contribution (approximately 20%)to total dietary protein intake among clients.

The focus on DVA patients to a certain extent provides a case study of a defined group, but also limits generalisability of the findings considered because of the non-representative nature of the group. DVA clients enjoy extensive governmental support with access to various medical and allied health services, as well as exclusive home support services for independent living, rehabilitation services, superior pensions, compensations and subsidised loans (Department of Veteran's Affairs, 2013). Extensive support for veterans was also available in the USA, through Home Based Primary Care (HBPC), a preventive scheme to support DVA clients to live independently at home whilst reducing risk of hospital admission (Leftwich Beales and Edes, 2009). The fact that improvements were seen in this group who already receive a superior level of care, to non DVA clients is promising.

Other study limitations include the small sample size and a relatively short period of low intensity intervention. However, the pragmatic study design allows better translation to practice as compared to longer, more intensive studies that may test interventions that are too labour intensive and expensive to implement. The lack of a control group and non randomised nature of the intervention are considered major limitations. While the pre-post study design limits scientific quality, we consider it to be unethical to have a control group of at risk, or malnourished people who did not

receive active interventions. All participants received tailored interventions to meet their needs, but the study is considered largely descriptive and exploratory although it has been shown to be feasible for this age group.

Nevertheless, in addition to the usual range of services that can be accessed, the provision of home-based individualised dietetic care resulted in an improved nutritional status after 3 months. This suggests that non-DVA clients may get greater benefits from this kind of service, but further investigation is warranted. Previous findings from the same region highlighted the fact that most older inpatients that were identified as either malnourished or at risk of malnutrition are discharged home (Robinson et al., 2011). This makes a strong case for the need for nutrition intervention in the community. A strength of this study is that all measurements and individualised dietary interventions were performed by a single dietitian, thereby limiting inter-observer bias. Further qualitative evaluations are also needed to identify factors that influence older adults' food choices and eating behaviours in the period post hospital discharge.

4.5 Conclusion

An individualised home based dietetic service improved the nutritional status of a group of older people discharged from hospital and is a model that warrants further demonstration of its effectiveness.

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4.7 Authors' contribution

AHH drafted and revised the manuscript, designed, analysed and interpreted the data.

AC collected the data and critically reviewed the manuscript, KC, KW, LT, MM, GP and JP concepted and designed the study; and critically reviewed the manuscript. All authors approved the final version of manuscript submitted for publication.

The authors declare that they have no conflicts of interest.

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CHAPTER 5 (STUDY 2)¹⁵

STATEMENT

This thesis has been prepared in journal article compilation style format. This thesis includes a chapter that has been published in a peer-reviewed journal article publication:

Chapter 5:

Hamirudin AH, Charlton K, Walton K, Bonney A, Albert G, Hodgkins A, et al. 'We are all time poor' Is routine nutrition screening of older patients feasible? *Australian Family Physician*. 2013;42:321-6.

As the primary supervisor, I Associate Professor Karen Charlton, declare that the greater part of the work in this above article is attributed to the candidate, Aliza Haslinda Hamirudin.

In the manuscript, Aliza contributed to study design and was primarily responsible for data collection, data analysis, data interpretation and writing up the manuscript. The first draft of the manuscript was written by the candidate and Aliza was then responsible for editing the suggestions of her co-authors.

Associate Professor Karen Charlton
Primary Supervisor

¹⁵ Findings from this chapter were presented at the:

1. 16th International Congress of Dietetics, Sydney, Australia, 5-8 September 2012 (oral presentation)
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Title: 'We are all time poor ... but there is opportunity': Targeting barriers to routine nutrition screening of older adults in General Practice.
2. 36th Nutrition Society of Australia Annual Scientific Meeting, 27- 30 November 2012 (poster presentation)
Hamirudin AH, Charlton KE, Walton KL, Bonney A, Potter J, Milosavljevic M, et al. What's on the menu for the 75+ Health Assessment?: An opportunity for nutrition screening of older patients in General Practice. *Australasian Medical Journal (Online)*. 2012;5(12):712.
3. 2013 International Academy Nutrition and Aging (IANA) Meeting, Seoul, Korea, 23 June 2013 (oral presentation)
Hamirudin A.H, Charlton K, Walton K, Bonney A, Albert G, Hodgkins A, Potter, J., Milosavljevic, M. & Dalley, A. 2013. Towards routine nutrition screening of older patients in Australian General Practice: Participatory research needed to engage practitioners. *The Journal of Frailty & Aging*, 2 (2), 112.

5 “WE ARE ALL TIME POOR.” IS ROUTINE NUTRITION SCREENING OF OLDER PATIENTS FEASIBLE?

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Abstract

Background

Despite clinical guidelines that recommend routine nutritional screening for older patients, this does not occur in Australian General Practice settings. This study aimed to identify perceived barriers and opportunities to implementing nutrition screening in General Practice.

Methods

Twenty five in-depth individual interviews were conducted with General Practitioners (n= 10), General Practice Registrars (n= 5) and practice nurses (n= 10). Interviews were audio-recorded, transcribed verbatim and analysed thematically. Observations were also performed to identify opportunities to conduct nutrition screening within practice workflow.

Results

The primary identified barrier related to time constraints, was further validated by observational component, and the main opportunity was within the existing Health Assessment for people aged ≥ 75 years (75+ HA).

Discussion

Incorporation of a validated short nutritional screening instrument into the existing 75+ HA was identified as the most feasible way to encourage uptake of nutrition screening in General Practice.

Keywords: malnutrition, nutrition screening, barrier, opportunity.

5.1 Introduction

Recent Australian data has demonstrated that malnourished older patients admitted to either acute (Charlton K et al.) or rehabilitation hospitals (Charlton et al., 2012a) have a 3.5 fold increased risk of dying within a 12 – 18-month follow-up period, compared to their age-matched non-malnourished peers, even accounting for underlying illness and other confounders. Prolonged length of hospital stay, increased rate of hospital readmissions and referral to higher level of care were other associated outcomes (Charlton K et al., Charlton et al., 2012a). Importantly, most of these patients were discharged home, in a poorly nourished state, and would be under the care of their General Practitioners.

Malnutrition in community dwelling older adults is often undiagnosed and under recognised despite the existence of clinical guidelines that recommend routine nutrition screening (Australian and New Zealand Society for Geriatric Medicine, 2009, Watterson et al., 2009). Nutrition screening, which is an initial step to identify malnutrition, is defined as ‘The process of identifying clients with characteristics commonly associated with nutrition problems who may require comprehensive nutrition assessment and may benefit from nutrition intervention’ (Watterson et al., 2009). However, nutrition screening is not routinely conducted in General Practice despite evidence that early intervention improves clinical outcomes and patient quality of life (Watterson et al., 2009). Patients indicate that further intervention from health professionals including dietitians is highly regarded to further manage their health issues (Bonney et al., 2012).

Annual health assessment of persons aged 75 years and older (75+ HA) is an initiative which aims to improve older patients' health and includes reviewing patients' nutritional status (Department of Health and Ageing, 2010). However, uptake of the 75+ HA is low (Kelaher et al., 2005) and a validated nutrition screening tool is not a component in 75+HA (Department of Health and Ageing, 2010).

This study is the first step in identifying practical ways in which nutritional screening could be implemented in General Practice. The aim of this study was to identify perceived barriers and opportunities to implementing nutrition screening in older adults among health care professionals in primary care settings.

5.2 Method

This study was an exploratory qualitative study to better understand this issue. In depth face to face individual interviews were conducted using a semi-structured interview guide in three general practices within the Illawarra and Shoalhaven regions of New South Wales in March and April 2012. The interviews were conducted within a two week period in each practice. The practices were purposively sampled from metropolitan, regional and rural areas and general practitioners (GPs), general practice registrars (GPRs) and practice nurses (PNs) were recruited from each practice. All participants who agreed to participate in the study provided their written consent prior to completion of their in-depth interview.

Interviews were digitally recorded and transcribed verbatim. Data was coded using constant comparison for topics development. Based on content analysis, topics were allocated into themes (Pope and Mays, 1995) and analysis was performed using qualitative analysis software, QSR NVivo version 9. A single researcher conducted the analysis, thereafter the results were discussed between the research team

members (three of whom were senior GPs whose practices had participated) and consensus reached. All participants were invited to review their individual transcripts during practice feedback sessions and before finalization of the analyses (Harris et al., 2009). No further commentary was received from the participants.

In addition to individual interviews, triangulation was conducted using observational data collected in the same three general practices by the same single researcher. The purpose of the observational component was to identify opportunities within the practice workflow where best a nutrition screening activity could be incorporated (Pope and Mays, 1995). Practice managers and receptionists were informed when the observations would be taking place and a notice was placed at the reception to inform patients of the activity. Time spent in each clinical area was documented for a sample of five older patients who attended the practice on the day of observation at each practice. Observations took approximately five to six hours a day. Reception staff informed the researcher if the patients were aged 65 years and older.

This study was approved by the Health and Medical Human Research Ethics Committee, University of Wollongong (HE11/232).

5.3 Results

The three practices have at least four GPs (three FTE), three practice nurses (1.5 FTE), a practice manager (1 FTE) and 2 reception staff (1FTE). The caseload is very broad and the rural general practice has a higher than average older population than the other two practices. The rural and regional general practices are mixed-billing practice, while the metropolitan general practice is a bulk-billing practice. Twenty five participants were recruited from three general practices: general practitioners (n= 10), general practice registrars (n= 5) and practice nurses (n = 10) (*Table 5-1*). Data saturation was reached by the twenty-second interview (n=25), although all interviews were analysed.

Table 5-1 Participants' Demographics

| Participants | Gender | | Age | | | | | Years of working in General Practice |
|-----------------------------------|--------|--------|-------|-------|-------|-------|-----|--------------------------------------|
| | Male | Female | 20-29 | 30-39 | 40-49 | 50-59 | >60 | |
| General Practitioner (n = 10) | 8 | 2 | 0 | 0 | 8 | 1 | 1 | Between 2.5 to 21 years |
| Practice Nurse (n = 10) | 0 | 10 | 1 | 1 | 3 | 5 | 0 | Between 1 to 11 years |
| General Practice Registrar (n= 5) | 1 | 4 | 2 | 3 | 0 | 0 | 0 | Between 4 weeks to 1 year |

5.3.1 Barriers to implement nutrition screening

Seven major themes were identified from the interviews regarding barriers to implement nutrition screening in older adults in the general practice setting (*Table 5-2*).

Theme 1: Lack of time.

Time constraints were identified as the major barrier.

“Time, yes. Time factors that general practitioners are very busy people dealing with lots of things at the same time. You’re looking at least to carry something like that you need to put at least ten to 15 minutes on top of your consultation which you really don’t have, so time is a big thing.”-GP2.

Practice nurses tended to have a consistent point of view that time needed to be allocated to perform nutrition screening outside of routine consultations.

“I think it’s like everything – it’s a time source and it’s allowing and making the time available.”-PN3.

Theme 2: Patients’ attitude towards nutrition.

There was a view that older patients themselves may be unwilling to undergo screening related to their nutritional status when they have come to the practice for other medical concerns.

“If they come to you for one thing and then you start asking them a million more questions about something that they don’t consider to be even indirectly or directly related, they’ll just switch off.” –PN5.

There was also a perception that many older patients feel uncomfortable about revealing poor dietary behaviours.

“The diet reported and the diet actually eaten are often completely different because they know they should eat three good meals a day.”-GP10

Theme 3: General practice limitations.

The financial implication for the practice was an important issue that raised concern about the feasibility of introducing nutrition screening. General practitioners, particularly, felt that additional activities would reduce the number of patient appointments, thereby affecting practice income and efficiency of operating costs, as well as patient care.

“Whilst ten minutes spent by the nurse asking questions about nutrition may be very beneficial, it is costing the practice money both in the nurse’s time and the time spent taking up that room when that can’t be done elsewhere.”-GP6.

Inadequate resources, in terms of both staff and space, were identified as barriers which are closely related to extra cost to the practice.

“Well I guess ideally if you had the room and you could put on a lot more staff to be able to do that but that would then cost and so... everything that you do actually costs you money in paying wages.”-GP4.

Theme 4: Lack of nutrition screening knowledge.

None of the interviewees reported having used any validated nutrition screening instruments to identify nutritional risk in older patients. Currently, nutritional risk is informally assessed using a variety of questioning and measurements, including:

dietary intake, food preparation, medical evaluation, social background, anthropometric measurement, financial status, patients' attitude, mobility status, psychology, family involvement and food access. Participants mentioned that appropriate training in nutrition screening is needed.

"Oh, the lack of training and lack of emphasis in my training"-GP9.

Theme 5: Low priority for nutrition.

Insufficient awareness of the importance of nutrition among general practice staff and patients resulted in nutrition being a low priority in clinical care within the general practices involved in the study. Nutrition education was perceived as the dietitian's role rather than the responsibility of practice staff.

"I don't identify it as a major problem although I recognise it is a problem."-GP3.

Theme 6: Lack of resources.

By identifying nutritional risk, participants identified a need for additional relevant resources to allow further nutrition-related intervention. Further, limited access to dietitians was seen as a barrier, particularly in rural areas.

"Well in this region so we have a dietician who visits here once every two months...for half a day but that's purely just for our diabetic patients. There's a community dietician in X but that's really primarily for diabetes and some very, very high risk patients but it's only one dietician for a whole quite large region."-GP5.

Theme 7: Outcomes of nutrition screening.

Concern was expressed about whether nutrition screening would result in beneficial patient outcomes.

“I think you’d have to have some feel for what your pick up rate was going to be and you’d have to have some kind of feel for what is the outcome for having detected malnutrition and what are the resources available for doing something about it and even then, what are the outcomes of trying to do something about it?”-GP5.

Table 5-2 Barriers to implement nutrition screening

| Key themes and topics |
|--|
| Key theme 1: Lack of time |
| Time (n= 21) n=8 GPs, n=8 PNs and n=5 GPRs |
| Key theme 2: Patients’ attitude towards nutrition |
| Patients’ unwillingness to be screened (n=9) n=3 GPs, n=3 PNs and n=3 GPRs |
| Patients come for medical consultation (n=6) n=3 GPs, n=3 GPRs |
| Patients willingness to change if problem is identified (n=4) n=2 GPs, n=2 GPRs |
| Patients don’t want to reveal correct information (n=2) n=1 GP, n=1 PN |
| Key theme 3: General Practice limitations |
| Cost (n=7) n=4 GPs, n=3 PNs |
| Lack of staff (n=2) n=1GP, n=1 GPR |
| Compliance (n=2) n=1 GP, n=1 PN |
| May reduce access to appointments (n= 2) n=2 GPs |
| Following up the issue if identified (n=1) n=1 PN |
| Room availability (n=1) n=1 GP |
| Key theme 4: Lack of nutrition screening knowledge |
| Lack of knowledge and training (n=3) n=2 GPs, n=1 GPR |
| Key theme 5: Low priority for nutrition |
| Nutrition is not a high priority for patients (n=2) n=1 GP, n=1 PN |
| Nutrition screening is not recognised as important thing to do (n=2) |

| |
|--|
| n=1 GP, n=1 PN |
| Nutrition is not recognised as a major problem (n=1) n=1 GP |
| Nutrition awareness (n=1) n=1 GP |
| Nutrition education is dietitian's role (n=1) n=1 GP |
| Key theme 6: Lack of resources |
| Limited resources in rural area (n=2) n=1 GP, n=1 PN |
| Set up resources (n=1) n=1 PN |
| Access to resources (n=1) n=1 PN |
| Key theme 7: Outcomes of nutrition screening |
| Does screening make better outcome (n=1) n=1 GP |

5.3.2 Opportunities to implement nutrition screening

Three key themes were identified from interviews regarding opportunities to implement nutrition screening in general practice (*Table 5-3*).

Theme 1: Current practice.

Wide support to incorporate nutrition screening within current practice was received. Most participants indicated that nutrition screening should be incorporated within the existing Health Assessment for older persons age over 75 (75+ HA).

“It should be incorporated in our health assessment but we just... we just generally ask “Are you eating adequately?” We don’t go into any depth.”-PN8.

Other identified opportunities included the General Practice Management Plan (GPMP), Team Care Arrangement (TCA) and having allocated time to screen the patients.

Theme 2: Patients’ condition.

If patients look unwell and this condition could be related to nutrition, nutrition screening could be conducted to further identify the problem.

“I guess another opportunistic time to do it is when they’re already coming in feeling unwell”-GPR5

Besides these contacts, screening all new patients was seen as another opportunity.

Theme 3: Staff initiative.

Having a dedicated staff member to implement nutrition screening, under the direction of general practitioners, and promotion of this activity to patients were seen as opportunities.

“If it was a direction that the doctors wanted to take then yes, there would be opportunity.”-PN2




Table 5-3 Opportunities to implement nutrition screening

| Key themes and topics |
|---|
| Key theme 1: Current practice |
| Within 75 + health assessment (n= 24) n=10 GPs, n=9 PNs and n=5 GPRs |
| Within management plan (n=6) n=3 GPs, n=2 PNs and n=1 GPR |
| Within consultation (n=4) n=2 GPs, n=1 PN and n=1 GPR |
| Within Team Care Arrangement (n=3) n=1 GP, n=2 PNs |
| Have allocated time to screen (n=3) n=1 GP, n=2 PNs |
| Key theme 2: Patients' condition |
| Opportunistic screening if patient is unwell (n=2) n=2 GPRs |
| For every new patient (n=1) n=1 GP |
| Key theme 3: Staff initiative |
| Have dedicated staff who implements screening initiatives (n=1) n=1 GP |
| If directed by GP (n=1) n=1 PN |
| If promoted to patients (n=1) n=1 GP |

5.3.3 Observational analysis

Eighty-two observations were performed in the three participating general practices. This component corroborated the interview data and identified time constraints as being a significant barrier to performing nutrition screening (*Table 5-4*). No extra time was available in consultation rooms in which to conduct additional activities due to tight time appointment scheduling, lack of time between appointments, high workflow and low staff redundancy. Available time was identified in the waiting area as patients spent up to 21 minutes in this area.

Table 5-4 Time spent by patients in three general practices from arrival till leaving (n=82)

| Patient Flow | N | Mean Time spent | Std. Deviation | Range | Min | Max |
|---|----|-----------------|----------------|-------|-----|------|
| Reception desk (arrival) | 82 | 0.3 | 1.1 | 9.0 | 0.0 | 9.0 |
|  | | | | | | |
| Waiting room | 82 | 21.2 | 13.9 | 61.0 | 1.0 | 62.0 |
|  | | | | | | |
| Consulting room | 71 | 13.9 | 7.2 | 34.0 | 2.0 | 36.0 |
| Nurse room | 11 | 14.7 | 6.0 | 20.0 | 5.0 | 25.0 |
|  | | | | | | |
| Reception desk (departure) | 82 | 0.4 | 1.0 | 5.0 | 0.0 | 5.0 |
| Total time (minute) | | 37.4 | 15.8 | 73.0 | 7.0 | 80.0 |

5.4 Discussion

A primary objective of the \$3.7 billion aged care reform package of the federal government, announced on 20th April 2012, is to encourage older adults to remain in their homes for as long as possible (Department of Health and Ageing, 2012b). Early identification of nutritional risk through routine nutrition screening, together with appropriate management of malnutrition, in older patients attending General Practice will be integral to maintaining independence and functionality (Flanagan et al., 2012). This study is the first to report perceived barriers and opportunities to implementing nutrition screening in Australian primary care using participatory research techniques. An abundance of previous studies have targeted barriers to conducting nutrition screening among health professionals in the hospital setting (Mowe et al., 2008, Rasmussen et al., 1999, Porter et al., 2009, Raja et al., 2008, Lindorff-Larsen et al., 2007, Rasmussen et al., 2006), but this data is not transferable to General Practice.

In-depth interviews identified time constraints as being the main barrier to performing nutrition screening in general practice, a findings that was further validated using an observation study component. Mean length of consultation time with a GP in our study of 71 patients was 13.9 minutes which is shorter than previous reports of 15.2 minutes (Britt et al., 2012) but would be prohibitive to inclusion of additional questions on dietary habits. Along with chronic disease management, patients themselves would like their GPs to provide nutrition care (Ball et al., 2012a). Practice nurses were identified as being the most appropriate to incorporate nutrition screening into their workflow, with follow up by GPs, thereby

enhancing the quality of nutritional care, as has been reported in systematic reviews (Laurant et al., 2004).

Our findings are consistent with an Australian hospital-based study (Raja et al., 2008, Porter et al., 2009) as well as Danish (Lindorff-Larsen et al., 2007, Rasmussen et al., 1999) and Canadian (Rasmussen et al., 2006, Villalon et al., 2011) studies that similarly identified time constraints, a low priority of nutrition, and limited knowledge of the topic as the main barriers to implementing nutrition screening of patients. According to Australian dietitians working in hospitals and aged care facilities, inadequate resources of time and staff prohibit nutrition screening, the practices of which have not changed over a decade (Ferguson et al., 2010). Despite clinical guidelines that recommend nutrition screening of all patients aged ≥ 65 years in both hospital and general practice in both Australia (Watterson et al., 2009, Australian and New Zealand Society for Geriatric Medicine, 2009) and other countries (Kondrup et al., 2003, National Institute for Health and Clinical Excellence, 2006b), these are generally not implemented (Schindler et al., 2010). Practitioners perceived that some older patients would be unwilling to undergo nutrition screening for fear of recommendation to a higher level of residential care services if found to be at malnutrition risk. Some GPs identified that a patient's lack of interest in dietitian consultation may prevent them from referring that patient to a dietitian for further management (Nicholas et al., 2003).

Despite policies for detection and treatment of malnutrition being focused on the hospital setting, it is becoming recognized that the majority of malnutrition is found in the community (Elia et al., 2010). In the UK, more than 3 million individuals are

estimated to be at risk of malnutrition, about 93% of whom live in the community while only 2 % of all malnutrition is found in hospitals (Elia et al., 2010, Elia and Russell, 2009). The UK National Institute for Health and Clinical Excellence (National Institute for Health and Clinical Excellence, 2006b) guidelines recommend that patients should be screened not only on admission to hospitals but also on admission to care homes, on their first outpatient appointment and on registration with a General Practitioner. In Australia, Visvanathan (2009) recommends that nutrition screening for older adults should occur not only in acute care, rehabilitation and residential aged care settings, but also be included regularly as part of general practice health assessments and eligibility assessments in community programmes for the elderly.

Despite identification of major barriers, a number of opportunities for nutrition screening were identified in the present study. Overwhelmingly, support was expressed for incorporation of a validated nutrition screening tool into the 75+ HA (Flanagan et al., 2012). The 75+ HA is a Medicare Benefit Schedule item which has been formulated to support collaboration between general practitioners, nurses and allied health professionals to provide preventive care, with the intention of improving health outcomes of older people (Gray and Newbury, 2004). At present, items that address diet and nutritional status within the 75+ HA proforma are too non-specific to identify nutritional problems. Our study participants identified a need for a validated, practical and quick nutrition screening tool. In 1998, Australian Nutrition Screening Initiative (ANSI) was introduced in Australia as nutrition screening tool for older people (Lipski, 1996) and this tool was used in general practice as part of the 75+ HA (Newbury et al., 2001). However, this tool has poor validity and

reliability (Phillips et al., 2010). The 6-item Mini Nutritional Assessment-Short Form (MNA-SF) is the only such instrument that has been validated for use in older people (Bauer et al., 2010). The MNA-SF includes one anthropometric measurement (either BMI or calf circumference) however the remaining 5 items could be self-completed by patients or their carers, during the time spent in the waiting area.

The main limitation to our study findings relates to an inability to generalize the findings to other practices across New South Wales, or other states. General practices from a metropolitan, regional and rural area were purposively sampled, but large inner city based practices were not included, nor were remote centres represented. Context-specific factors that may have important influences could include less access in rural areas to dietitians, or length of work experience of general practice staff. This study is at the forefront of addressing the global gap on research related to improving nutritional topic in community settings (Green and James, 2013), particularly in general practice.

5.5 Conclusion

Nutrition screening is the first step in the process of improving nutritional and associated clinical outcomes of patients. Those identified to be at nutritional risk need to be followed up with appropriate nutrition intervention using a multidisciplinary approach (Weekes et al., 2009). Findings from this novel general practice based study will inform further direction for the implementation of routine nutrition screening of older patients in general practice. The next phases of our research will identify optimal treatment pathways following screening.

5.6 Implications for general practice

It is undeniable that general practice is the first point for older patients in seeking advice regarding health issues. Early identification and management of malnutrition in older adults would be facilitated if routine nutrition screening were to be implemented in general practice, however this will require upskilling of practice nurses and better uptake of the 75 +HA item by eligible patients..

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CHAPTER 6 (STUDY 3)¹⁶

STATEMENT

This thesis has been prepared in journal article compilation style format. This thesis includes a chapter that has been published in a peer-reviewed journal article publication:

Chapter 6:

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As the primary supervisor, I Associate Professor Karen Charlton, declare that the greater part of the work in this above article is attributed to the candidate, Aliza Haslinda Hamirudin.

In the manuscript, Aliza contributed to study design and was primarily responsible for data interpretation and writing up the manuscript. The first draft of the manuscript was written by the candidate and Aliza was then responsible for editing the suggestions of her co-authors.

Associate Professor Karen Charlton
Primary Supervisor

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6 TRENDS IN UPTAKE OF THE 75+ HEALTH ASSESSMENT IN AUSTRALIA: A DECADE OF EVALUATION

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Abstract

Objective

In Australia, older adults aged 75+ years are encouraged to avail themselves of the comprehensive 75+ Health Assessment (75+ HA), to identify medical conditions and highlight potential risk factors for poor health. However, uptake of this item has been reported to be low. This study aimed to identify uptake of 75+ HA within regional areas of New South Wales and compare this against state and national trends over an 11 year period.

Methods

Data on uptake of the 75+ HA for item numbers 700 and 702 from 1999 until 2010 were obtained from the Medicare Australia portal and Department of Health and Ageing databases. Trends over time were collated and compared at the regional, state and national level.

Results

An increasing number of 75+HAs were performed from 1999-2009. Overall uptake of the 75+HA is generally low across Australia, at about 20 % of the eligible population, but varies across states and even regions.

Conclusion

Uptake remains low although encouraging trends were evident over a decade of 75+HA implementation. Strategies in improving the uptake should be targeted for early identification of health risk and overall improved quality of health in older adults.

Keywords: health assessment, older adults, primary prevention, primary health care, general practice

6.1 Introduction

In Australia, as in all developed nations, the high prevalence of chronic disease in the ageing population is a major contributor to the burden of disease nationally (Mathers et al., 2000), with much of this burden potentially amenable to preventive interventions (AIHW, 2008, Mathers et al., 2000). The Australian National Preventive Health Agency (ANPHA) (2013) highlighted a major role for primary care with regard to the implementation of preventative health strategies. For older adults, General Practitioners (GPs) are an integral provider of health promotion activities (Sims et al., 2000), including health assessment screens.

In 1999, the 'Enhanced Primary Care' (EPC) package was introduced by the Commonwealth Department of Health and Aged Care which included 'Health assessments for adults aged 75 years and over' (75+ HA) (Department of Health and Ageing, 2010). The EPC package was formulated to support collaborative clinical work among GPs, nurses and allied health professionals while providing preventive care, and to improve older persons' access to health services (Gray and Newbury, 2004). The 75+HA involves evaluation of various medical and non-medical conditions including cognition, social status, activities of daily living (ADL), depression, mobility and nutritional status. The Medicare Benefit Schedule (MBS) item number 700 can be performed within the consulting room while item number 702 is reserved for assessment in the patient's home.

Gray and Newbury (2004) define health assessment as 'a structured approach to assessment of older people using standardized protocols.' Two important functions include identification of psychosocial issues, clinical problems and disability; and to

evaluate preventable disorders and the risk of adverse events. The main purpose of health screening in this vulnerable age group is to facilitate timely and appropriate interventions to prevent further decline in function or complications associated with chronic conditions (Gray and Newbury, 2004). This aligns with aged care reforms in Australia that aim to support older adults to live longer at home in the community while still maintaining their independence (Department of Health and Ageing, 2012b).

In 2005, the EPC package was replaced by the Chronic Disease Management (CDM) items (Department of Health, 2014). From May 1st 2010, Medicare Benefit Schedule (MBS) items became available for GPs to undertake a 75+ HA (Department of Health, 2013), depending on the complexity of a patients' underlying health conditions (i.e. 701 (brief), 703 (standard), 705 (long) or 707 (prolonged)) , while, item numbers 700 and 702 were phased out (Table 6-1) (Department of Health and Ageing, 2010).

Uptake of the 75+HA by age-eligible Australians has not been comprehensively evaluated in the peer reviewed literature. The aim of this study was to identify trends in uptake of the 75+HA over the past decade and to determine whether these trends differ across states, as well as by metropolitan and non-metropolitan area of residence. The audit will provide insights into the role of general practice in providing preventative health care activities within the overall care of their older patients.

Table 6-1 Item numbers for Health Assessments pre and post May 2010.

| Pre May 2010 | | Post May 2010 | |
|--------------|---|---|--|
| Item No.s | Description | Item No.s | Description |
| 700 | Annual 75 years & plus health assessment at consulting rooms | 701 | Brief Health Assessment lasting not more than 30 minutes for any of the 7 included items |
| 702 | Annual 75 years and plus health assessment not being an attendance at consulting rooms, a hospital or a residential aged care facility | 703 | Standard Health Assessment lasting more than 30 minutes but less than 45 minutes for any of the 7 included items |
| 709 | One-off health assessment of a child during the 4 year immunization | 705 | Long Health Assessment lasting at least 45 minutes but less than 60 minutes for any of the 7 included items |
| 712 | Annual comprehensive medical assessment (cma) of a permanent resident of a residential aged care facility | 707 | Prolonged Health Assessment lasting at least 60 minutes for any of the 7 included items |
| 713 | Once in 3 years health assessment for type 2 diabetes risk evaluation for a patient who is 40 to 49 years of age (inclusive) with a high risk of developing type 2 diabetes | <p>The 7 included items are: -</p> <ul style="list-style-type: none"> a Healthy Kids Check; a 45-year old health assessment; a type 2 diabetes risk evaluation; an older persons health assessment; a comprehensive medical assessment for a permanent resident of an aged care facility; a health assessment for a person with an intellectual disability; and a health assessment for a refugee or humanitarian entrant. | |
| 714 | Annual health assessment for refugees and other humanitarian entrants not being an attendance at consulting rooms, a hospital or a residential aged care facility | | |
| 716 | Annual health assessment for refugees and other humanitarian entrants at consulting rooms | | |
| 717 | One-off 45 year old health assessment at risk of developing a chronic disease | | |
| 718 | Annual health assessment of a patient with an intellectual disability at consulting rooms | | |
| 719 | Annual health assessment of a patient with an intellectual disability not being an attendance at consulting rooms, a hospital or a residential aged care facility | | |

6.2 Methods

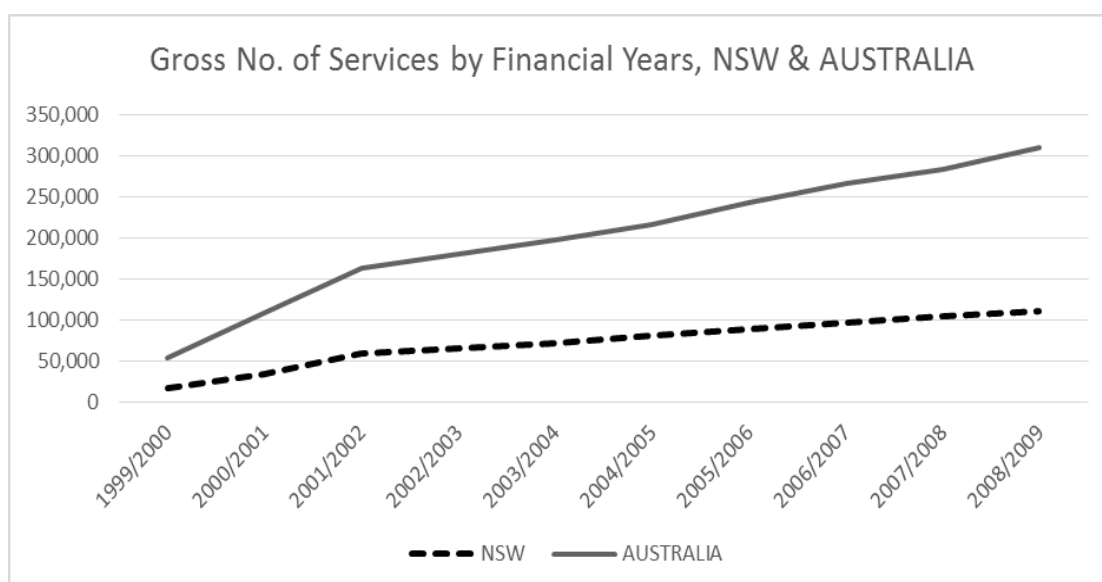
Data on uptakes of MBS items number 700 and 702 have been sourced from various public domain sources such as MBS item uptake reports from MBS online and MBS Primary Care Items reports from Department of Health and Aging (2012). The data were collated using MS Excel and multiple data tables created for the two item numbers (700 & 702) which were exclusive for 75+HA until 30th April 2010. Tables included demographic variables (age and sex) specific uptake and uptake by year. The change in MBS item numbers since 1st May 2010 necessitated substitution of item numbers 700 and 702 with the four time-based items (701; 703; 705 or 707). Our analysis excluded these new item numbers and hence for year to year comparisons covers the period 1999/2000 through to the end of the financial year 2008/9.

The total number of women and men aged 75 years and older who had accessed these services (as measured by claims for item numbers 700 and 702) between 2006/7 and 2008/9 was categorised into two age groups; 75 to 84 years and 85+ years. Age standardised rates of these services per 100,000 persons were assessed for state-level data and for national data. To assess whether there were state and regional differences in uptake of the 75+HA (as assessed by item numbers 700 and 702), rates were compared for the financial year 2009-10.

6.3 Results

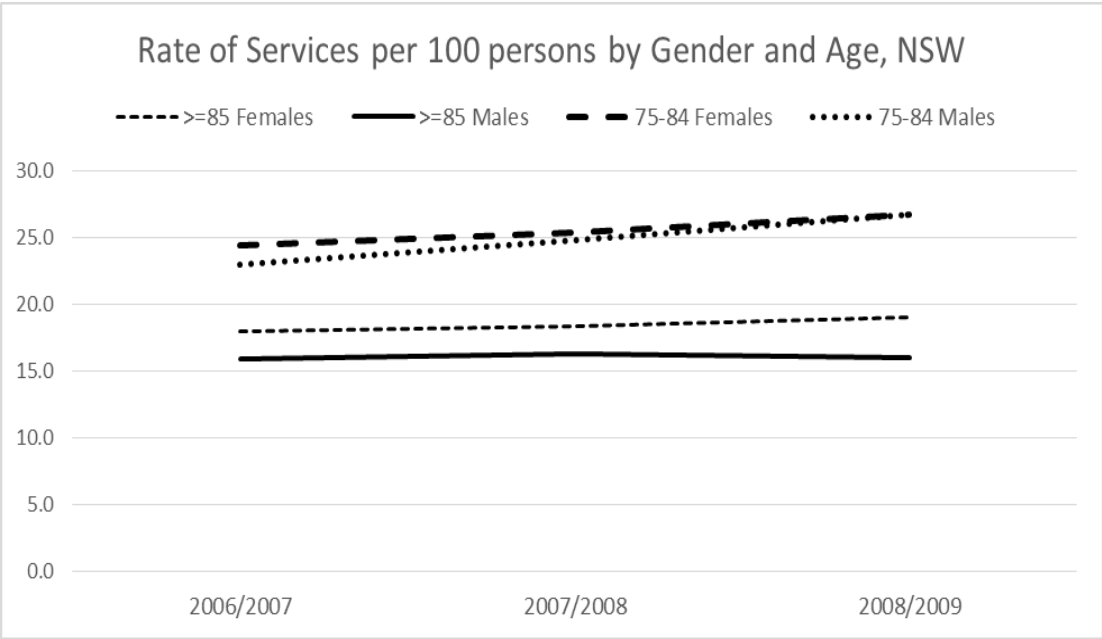
The gross number of services per financial year steadily increased across NSW and Australia for MBS items 700 and 702 combined, from the year 1999/2000 until a peak uptake of more than 100,000 (NSW) and 300,000 (Australia), respectively, in 2008/2009 (Figure 6-1).

Figure 6-1 Trends of Number of Gross Services, NSW and AUSTRALIA for the 75+ Health Assessment (MBS items 700 and 702)



The number of women and men aged between 75 and 84 years who had undergone a 75+HA in NSW increased from 2006/2007 and peaked for the year 2008/2009 (Figure 6-2). Equality of uptake by gender in the younger age group was evident in 2008/2009. Uptake of the 75+HA of older adults aged 85+ years were less than the younger age group with uptake of not more than 20 per 100 persons. A greater number of women than men aged 85+ years had accessed this service during the period 2006/2007 until 2008/2009.

Figure 6-2 Number of 75 + Health Assessments conducted in New South Wales, by age and gender, 2006-2009



The most recent time period for which data for items 700 and 702 are available is the financial year 2009/10. The states of NSW, Queensland (QLD) and Tasmania (TAS) had slightly higher age-standardised prevalence for uptake of 75+ HA than the national average, but Victoria (VIC), South Australia (SA) and Western Australia (WA) had lower than average figures and the Northern Territory (NT) had the lowest prevalence at approximately 6,000 per 100,000 persons for this period (Table 6- 2).

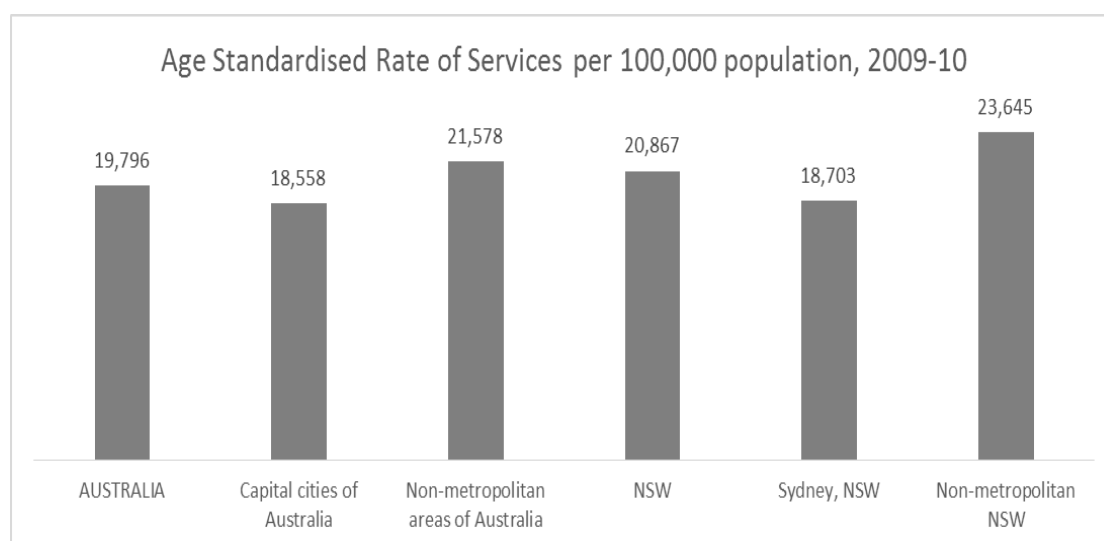
Table 6-2 State-level comparisons of 75+ Health Assessments performed in 2009-10.

| Region/State | Age-standardised rate of services per 100,000 population | Rate Ratio[*] |
|------------------------------|---|-------------------------------|
| New South Wales | 20,867 | 1.054 |
| Victoria | 18,123 | 0.915 |
| Queensland | 22,255 | 1.124 |
| South Australia | 18,900 | 0.955 |
| Western Australia | 16,733 | 0.845 |
| Tasmania | 21,127 | 1.067 |
| Northern Territory | 6,308 | 0.319 |
| Australian Capital Territory | 14,127 | 0.714 |
| AUSTRALIA | 19,796 | |

^{*} National age-standardised rate of services is reference category

National and NSW uptake of 75+ HA (items 700 and 702) in non-metropolitan areas were higher than Sydney and other capital cities of Australia. Overall rates of services in NSW also appeared to be higher compared to other areas (Figure 6-3).

Figure 6-3 Regional Comparisons in 75 + Health Assessments performed in 2009-10 in non-metropolitan regions of New South Wales and Australia compared with those performed in metropolitan regions



6.4 Discussion

This study provides evidence of trends over time in uptake of the 75+HA by age eligible sectors of the population. No studies have been published on this topic since 2005. Uptake of the 75+ health assessment in New South Wales has increased at a similar rate to that for Australia overall since its introduction in 1999. Stable increasing trends were identified until 2008/2009. Previous research reported that uptake of these MBS item numbers dramatically increased in the first two introductory years, from approximately 4,000 a month up to 13,000 per month by the end of 2001 (Wilkinson et al., 2002a). During this period, a total of 130,000 assessments were conducted in consulting rooms while close to 95,000 were performed elsewhere, such as in patients' homes (Wilkinson et al., 2002a).

6.4.1 Comparison with previous research

Our data supports observations that older women are more proactive in preventative health-seeking behaviour than men of the same age, as evidenced by the sex differential in the number of Medicare-funded health assessments (Chan et al., 2008, O'Halloran et al., 2006, Byles et al., 2007), that remains even after 85 years of age (Gill et al., 2008). In 2009-2010, our data shows that six states provided more than 15,000 services per 100,000 population (age standardised rate), except for NT and ACT. It is unclear why the risk ratio for conducting age-standardised rates of the 75+HA screen is higher than the national figure in the three states of NSW, Queensland, and Tasmania. During the early years of the introduction of the 75+HA version that is conducted in consulting rooms (item number 700), older adults in NSW, Victoria and Queensland had higher access to this service than in other states (Kelaher et al., 2005). Overall less than 10% of age-eligible older adults had

accessed the 75+HA between the years 2000 and 2004 across Australia (Kelaher et al., 2005). In the 11-year period from 1999, national uptake of the 75+HA had increased sixfold, however, overall uptakes remain low as only 20% of the eligible population had accessed this service. This may reflect a lack of awareness by older adults themselves or may reflect that low priority assigned to this item by general practice staff. A previous study has reported that 75% of 506 general practices sampled did not routinely invite eligible patients to undertake the 75+HA (Chew et al., 1994a). Over half (55%) of GPs surveyed perceived that patients did not welcome the 75+HA due to fear of negative outcomes, privacy invasion and consideration of themselves as being healthy and not in need of such health screens (Chew et al., 1994b). In contrast, patients who had undertaken the 75+HA perceived that it was beneficial to their wellbeing (Spillman et al., 2012, Gill et al., 2008) and that they were likely to repeat the assessment at a later date (Chew et al., 1994b).

6.4.2 Disparities in uptake

Disparities in uptake of the 75+HA exist among older adults who live in rural and urban areas (Byles et al., 2007, Wilkinson et al., 2002b). Age-standardised data on 75+HA for 2009-10 clearly illustrate the higher uptake of the health check in non-metropolitan regions of both NSW and Australia than in the more urban metropolitan regions of the state and the nation overall. A recently undertaken pilot study in a large Medicare Local Super Clinic in regional NSW reported that only 14% of eligible older people had undergone a 75+ health assessment in the previous 15 month period; which indicates many missed opportunities for conducting preventive health and well-being examinations of elderly patients (Ghosh et al., 2013). That regional assessment suggested that older residents in rural areas may have closer

connections with health services compared to metropolitan centres, as has been reported by others (Wilkinson et al., 2002b), and may therefore be more likely to have a health assessment performed (Byles et al., 2007).

6.4.3 Limitations

Due to changes in coding for practice reimbursements, the specific item numbers 700 and 702 that were exclusive to the 75+HA were no longer available after May 2010 (mid quarter 2). This limited our analysis of uptake of the 75+ HA until that time. Such change to MBS item numbers presents a challenge to population health care planners, as granular data for the 75+ component of the battery of health assessments available will need to be exclusively requested for future research and analysis purposes from Medicare Australia. A possible solution may be a data-sharing agreement between Medicare Australia and Medicare Locals to enable regular reporting of the uptake of preventive health-related Medicare items.

The analysis did not assess the role of practice nurses, rather than General Practitioners, in carrying out 75+ assessments.

6.4.4 Implications

The question of whether undertaking the 75+ HA improves health outcomes in older people has been investigated in a randomised clinical trial conducted over 12 months (Newbury et al., 2001). Although no changes in mortality rate associated with having had a 75+HA were found, improvements in self-rated health status were evident (Newbury et al., 2001). It may be that 12 months was insufficient to detect changes in mortality arising from preventive activities in this age group. However,

associations between higher self-rated health and improved clinical outcomes have been noted over longer time frames. For example, , in previous research, older Australian women who self-rated their health as 'poor' had a 5.3 (95% CI = 2.4, 11.7) greater relative risk of mortality over seven years compared to those who rated their health as 'excellent'(McCallum et al., 1994). In men, the relative risk was 3.1 (95% CI = 1.7, 5.8) for poor vs excellent self-rated health status. Another 9-year follow up study also demonstrated that poor-self rated health was associated with an increased mortality rate (Tiainen et al., 2013).

Undiagnosed medical and non-medical problems could be identified during the annual 75+ HA (Blakeman et al., 2001, O'Halloran et al., 2006, Cheffins et al., 2010), a further benefit identified by patients (Piccoliori et al., 2008). For example, nutrition-related problems in older adults is one of the commonly identified non-medical problems that may be identified within the screen (Cheffins et al., 2010). Malnutrition often remains undetected in older adults despite being a strong predictor of unfavourable health outcomes (Visvanathan et al., 2004a, Charlton et al., 2012a, Charlton et al., 2013) and the GP is in a unique position to identify problems related to nutritional risk, for referral to a dietitian for further evaluation, if necessary (Sampson, 2009). Various authors have advocated for inclusion of a validated nutrition screening instrument within the 75+ HA (Flanagan et al., 2012). General Practitioners and practice nurses, themselves, have also identified that the 75+HA is an opportunistic way to implement routine nutritional screening in community-dwelling older adults (Hamirudin et al., 2013).

There is evidence that health screening activities in older adults improves patient outcomes. Older adults who were monitored by healthcare professionals following health assessments reported having a better quality of life, compared to those that had not undergone a health screen (Byles et al., 2004). A meta-analysis reported that preventive care provided through home visits by general practice staff was effective in reducing mortality and nursing home admission in older adults (Elkan et al., 2001). Another meta-analysis demonstrated that completion of the comprehensive geriatric assessment, together with appropriate monitoring, resulted in reduced mortality rates and improved functional status (Stuck et al., 1993). A recent Finnish study indicated that an annual comprehensive geriatric assessment helped frail older adults to improve their mobility (Tikkanen et al., 2014). In Australia, the 75+HA is well received in patients who opt to have it performed, with 77% of this group perceiving the 75+HA to be beneficial to their health whilst 83% felt that conducting the 75+HA annually would be appropriate (Spillman et al., 2012). Further qualitative analyses of older adults' experiences within the primary health care setting are required to elucidate behaviours and perceptions in this age group regarding their access to preventive health services, barriers to uptake of health assessments, and outcomes that occur as a result of the 75+HA. This method of research has proved useful in identifying reasons why general practice nurses and doctors do not currently place a high emphasis on performing the 75+HA (Hamirudin et al., 2013).

Thus, the low uptake of the 75+ HA indicates a need for General Practitioners to increase awareness of its potential value in older patients, and strategies to encourage older people to avail themselves of this activity. Monitoring of patients and appropriate referral following completion of the 75+HA would improve its

applicability for early intervention in this high risk group, in order to assist older adults to live independently at home. Given the potential benefits of the 75+HA, further Australian research is needed to identify barriers to promotion of this health screen by General Practice staff and to investigate long-term outcomes of value to patients, including quality of life and maintenance of independence, as well as morbidity and mortality.

6.5 Authors' contribution

AHH designed the study, drafted and revised the manuscript, and interpreted the data. AG collated and analysed the data, and critically reviewed the manuscript. KC conceived the idea for the study, and critically reviewed the manuscript. AB and KW critically reviewed the manuscript. All authors approved the final version of manuscript submitted for publication.

The authors declare that they have no conflicts of interest.

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CHAPTER 7 (STUDY 4)¹⁷

STATEMENT

This thesis has been prepared in journal article compilation style format. This thesis includes a chapter that has been published in a peer-reviewed journal article publication:

Chapter 7:

Hamirudin, A. H., Charlton, K., Walton, K., Bonney, A., Potter, J., Milosavljevic, M., Hodgkins, A., Albert, G., Ghosh, A. & Dalley, A. Feasibility of implementing routine nutritional screening for older adults in Australian General Practices: A mixed-methods study. *BMC Family Practice*, 2014; 15, 186.

As the primary supervisor, I Associate Professor Karen Charlton, declare that the greater part of the work in this above article is attributed to the candidate, Aliza Haslinda Hamirudin.

In the manuscript, Aliza contributed to study design and was primarily responsible for data collection, data analysis, data interpretation and writing up the manuscript. The first draft of the manuscript was written by the candidate and Aliza was then responsible for the editing suggestions of her co-authors.

Associate Professor Karen Charlton
Primary Supervisor

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2. Australian Primary Health Care Nurses Association (APNA) National Conference, Sydney, Australia, 29-31 May 2014 (oral presentation)
Hamirudin A.H, Charlton K, Walton K, Bonney A, Albert G, Hodgkins A, Potter, J., Milosavljevic, M., Ghosh, A. & Dalley, A.
Feasibility of Mini Nutrition Assessment-Short Form (MNA-SF) and nutrition resource kit in General practice: A qualitative study

7 FEASIBILITY OF IMPLEMENTING ROUTINE NUTRITIONAL SCREENING FOR OLDER ADULTS IN AUSTRALIAN GENERAL PRACTICES: A MIXED-METHODS STUDY

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Abstract

Background

Nutrition screening in older adults is not routinely performed in Australian primary care settings. Low awareness of the extent of malnutrition in this patient group, lack of training and time constraints are major barriers that practice staff face. This study aimed to demonstrate the feasibility of including a validated nutrition screening tool and accompanying nutrition resource kit for use with older patients attending general practice. Secondary aims were to assess nutrition-related knowledge of staff and to identify the extent of malnutrition in this patient group.

Methods

Nine general practitioners, two general practice registrars and 11 practice nurses from three participating general practices in a rural, regional and metropolitan area within a local health district of New South Wales, Australia were recruited by convenience sampling.

Individual in-depth interviews, open-ended questionnaires and an 11-item knowledge questionnaire were completed three months following in-practice group workshops on the Mini Nutritional Assessment Short Form (MNA-SF). Staff were encouraged to complete the MNA-SF within the Medicare-funded 75+ Health Assessment within this time period. Staff interviews were digitally recorded, transcribed verbatim and analysed thematically using qualitative analysis software QSR NVivo 10.

Results

Four key themes were determined regarding the feasibility of performing MNA –SF: ease of use; incorporation into existing practice; benefit to patients' health; and patients' perception of MNA-SF. Two key themes related to the nutrition resource kit: applicability and improvement. These findings were supported by open ended questionnaire responses. Knowledge scores of staff significantly improved from baseline (52% to 66 %; $P<0.01$). Of the 143 patients that had been screened, 4.2% ($n=6$) were classified as malnourished, 26.6% ($n=38$) 'at risk' of malnutrition and 69.2% ($n=99$) as well-nourished.

Conclusion

It is feasible to include the MNA-SF and a nutrition resource kit within routine general practice, but further refinement of patients' electronic clinical records in general practice software would streamline this process.

Keywords: malnutrition, older adults, nutrition screening, training, feasibility

7.1 Introduction

The demographic group of adults aged 65 years and above have the highest frequency of consultations in General Practice in Australia, with the frequency of consultations increasing with age (Valenti et al., 2013). The BEACH (Bettering the Evaluation And Care of Health) study reported that between 2011 – 2012, patients aged 70 to 79 years had on average 12 General Practice interactions per year, which increased to 16 in those ≥ 85 years, as compared with about four per year in adults aged 25 to 49 years. It is estimated that adults aged ≥ 65 years account for 31 % of all encounters in General Practice (Britt et al., 2013a) and that these encounters have increased significantly in the last 10 years (Britt et al., 2013b).

Malnutrition is an under-recognized threat to older adults' health status which leads to numerous adverse health outcomes (Charlton et al., 2012a, Charlton et al., 2013). Older adults who are at nutritional risk have increased risk of illness (BAPEN Malnutrition Advisory Group, 2003a), more frequent visits to their general practitioners (BAPEN Malnutrition Advisory Group, 2003a), poorer quality of life (Arvanitakis et al., 2013) and higher mortality compared to their well-nourished counterparts (Charlton et al., 2012a). The estimated prevalence of nutritional risk in community living older adults in Australia is approximately 45% (Rist et al., 2012b, Visvanathan et al., 2003).

In Australia, within general practice settings, the timely identification and management of malnutrition should be a focus of preventative health activities in older adults for improved quality of patient care (Australian and New Zealand Society for Geriatric Medicine, 2009). The 'Enhanced Primary Care' (EPC) package that was introduced by the Commonwealth Department of Health and Aged Care in 1999 includes 'Health assessments for adults aged 75 years and over' (75+ HA) (Department of Health and Ageing, 2010). One of the aims of the EPC package was to improve older persons' access to health services (Gray and Newbury, 2004). The 75+HA includes evaluation of various medical and non-medical conditions including cognitive function, social status, activities of daily living (ADL), depression and mobility. However, a low uptake of this Medicare Benefits Scheme (MBS) funded item by age-eligible patients has been reported (Ghosh et al., 2013, Hamirudin et al., 2014b).

Clinical guidelines in Australia recommend screening for malnutrition in older adults across all health care settings, as well as in residential aged care facilities (Australian and New Zealand Society for Geriatric Medicine, 2009, Watterson et al., 2009, Kondrup et al., 2003, Mueller et al., 2011, National Institute for Health and Clinical Excellence, 2006b), but this does not routinely occur (Charlton, 2010). Within primary care, implementation of routine nutrition screening necessitates use of a validated instrument that is easy to use, practical in its application, and that provides results that can clearly be applied to clinical pathways and further referrals (Arrowsmith, 1999). Many nutrition screening tools exist for use in older adults (Green and Watson, 2006). The 6-item Mini Nutrition Assessment Short Form (MNA-SF) (Rubenstein et al., 2001) is an abbreviated and validated screen that has

been adapted from a more comprehensive 18-item version (Guigoz et al., 1996) . The MNA-SF can be completed within five minutes (Skates and Anthony, 2012) and is appropriate for community-dwelling older people (Phillips et al., 2010, Bauer, 2009).

In other countries, tackling malnutrition has been demonstrated to improve clinical outcomes and reduce health care use (Elia and Russell, 2009). In the UK, malnourished adults have disease related malnutrition costs in excess of £13 billion per annum, based on malnutrition prevalence figures and associated costs of both health and social care (Elia and Russell, 2009). It has been estimated that costs associated with malnutrition in European countries are more than twofold the costs related to obesity (Medical Nutrition Institute, 2012b). The National Institute for Health and Clinical Excellence has also demonstrated substantial cost savings associated with the implementation of a clinical guideline on malnutrition in adults (National Institute for Health and Clinical Excellence, 2006a).

Our earlier work (Phase 1 research) identified barriers faced by general practice staff that impact on the incorporation of nutrition screening in their interactions with older patients. These include time constraints, low prioritization of nutrition-related issues, cost of performing the activity and lack of knowledge and skills (Hamirudin et al., 2013). These findings identified a need for workshop-style training sessions to up-skill staff in the use of a validated nutrition screening instrument, accompanied with identification of clear nutritional management pathways and provision of appropriate nutrition resources. This approach has been shown by others to improve the success of implementation of a new process in the context of correcting malnutrition (Kennelly et al., 2010).

This study aimed to demonstrate feasibility of inclusion of a validated nutrition screening tool and accompanying nutrition resource kit for use in older patients attending general practice. Secondary aims were to assess whether a short training workshop improves nutrition-related knowledge of practice staff and to identify the extent of malnutrition in the patient group.

7.2 Methods

Practices from the Illawarra and Southern Practice Research network were invited by email to participate in the study. Three practices responded, located in regional, rural and metropolitan areas respectively within the Illawarra and Shoalhaven Medicare Local catchment area of New South Wales, Australia. All general practitioners (GPs) (n= 19), general practice registrars (GPRs) (n=2) and practice nurses (PNs) (n=12) from the general practices were invited to participate in the study. Each general practice was allocated to use a different format of the MNA-SF to conduct nutritional screening based on feedback sessions in an original scoping study that identified preferences for formats that would best fit within the individual practice settings (Hamirudin et al., 2013) : 1. Electronic format using an iPad; 2. Paper-based MNA-SF (to be completed by general practice staff); and 3. Self-administered version of the MNA (Self-MNA). Practice staff in the group allocated to the Self-MNA, were also required to complete the paper-based MNA-SF in order to determine whether there were discrepancies in the scoring. The MNA-SF categorises nutritional status into the following categories: well- nourished (score = 12-14), at risk of malnutrition (8-11), or malnourished (≤ 7).

A 60 minute training and discussion session on how to perform nutrition screening using the MNA-SF was provided by a dietitian (AHH) in group settings within each participating general practice. Participants completed a multiple choice questionnaire (MCQ) to assess their understanding of nutrition screening prior to participation in the training session, and again after three months. The MCQ was developed by the three nutrition content-matter experts in this study (AHH, KC and KW) based on key knowledge domains for assessing malnutrition in an older age group. Differences in scores were assessed statistically using a paired t-test. The IBM SPSS statistics software version 21 was used for statistical analysis. A Microsoft Power Point presentation, MNA-SF video (Nestle Nutrition Institute, 2014c) and case studies were incorporated into the training session. Each participant was also provided with a resource kit specifically developed for use in their own general practice. The kit included: a flexible tape measure (Seca 201, Hamburg, Germany); an information booklet ('Managing malnutrition on our doorstep: A practical guide for general practice' booklet) (Nestle Nutrition, 2011); an MNA-SF tear off pad; a laminated chart of the recommended nutrition intervention pathways following nutritional screening; and copies of resources for distribution to patients. A portable stadiometer (Seca 217, Hamburg, Germany) and a digital flat scale (Seca 876, Hamburg, Germany) were provided to each practice.

The training session was conducted at each of the practices with consenting staff. The resource kit for patients included a non-perishable high energy and high protein foods leaflet, 'Eating Well' booklet (NSW Health, 2011), a relevant local council directory of nutrition-related services and available support services for older persons in the catchment area.

For a period of three months following completion of the training session, staff were encouraged to invite patients aged 75 years and older who were undergoing the 75+HA and those attending the practice for consultations to additionally include the MNA-SF. Patients who agreed to be screened completed a written consent form. Patients who were identified to be ‘at risk of malnutrition’ or ‘malnourished’ were provided with a resource kit and other interventions, as outlined in the MNA-SF nutrition intervention pathway guide (Nestle Nutrition Institute, 2014b). Additionally, it was advised that patients identified to be malnourished were referred to an accredited practising dietitian.

After three months, all participants (GPs and nurses) who attended the training session were invited to complete an open response questionnaire and in-depth individual interviews at each general practice. Participants’ perceptions about feasibility of administering the MNA-SF and the usefulness of the resource kit were assessed. The open-response questionnaire was developed and adapted by research dietitians (AHH, KC and KW) based on an Irish study in a community setting (Kennelly et al., 2010) which investigated the feasibility of implementing use of a validated nutrition screening tool, together with nutrition resources. The open ended questionnaire served as triangulation (Harris et al., 2009) for the in-depth interviews to further validate the results. The initial lines of inquiry, before individual exploration of interviewees’ responses, are shown in Table 7-1. All interviews were audio recorded, transcribed verbatim, coded into topics and thematically analyzed using qualitative analysis software QSR Nvivo version 10.

An iterative process for topics coding involved constant comparison, whilst themes emerged according to topics coding (Pope and Mays, 1995). AHH undertook the initial topics coding through constant comparison, and AHH, KC and KW performed secondary coding and thematic analysis before circulation to all team members for further discussion and consensus. Quotes selected for reporting were chosen based on the most profound quotes in findings (Anderson, 2010) and from various participants to demonstrate reliability of the analysis (Côté and Turgeon, 2005). Ethics approval was obtained from University of Wollongong Health and Medical Human Research Ethics Committee (HE12/381).

Table 7-1 Initial lines of inquiry used in the in-depth interviews

| |
|---|
| <p>1. Do you feel that the MNA-SF is better able to identify nutrition-related problems than using the 75+ Health Assessment alone?</p> <p>2. How do you feel that the MNA-SF was received by patients? Were they comfortable with answering the questions? And having measurements taken? (For general practice staff who completed MNA-SF)</p> <p>How was the MNA-SF received by patients who completed it themselves? (For patients from general practice who self-completed MNA-SF)</p> <p>3. Do you feel more confident to identifying malnutrition in older people since you attended the discussion session?</p> <p>4. Do you feel more confident in managing malnutrition in older people since you attended the discussion session?</p> <p>5. What additional resources or information should be made available about nutrition to staff working in General Practice?</p> <p>6. Is there anything else you would like to comment on regarding your experiences either in the discussion session or administering the nutrition screening tool?</p> <p>7. Has the nutrition screening increased your awareness about the prevalence of malnutrition and nutritional risk in general practice?</p> <p>8. Do you think that the MNA-SF should be included as a formal part of the 75+HA?</p> |
|---|

7.3 Results

Twenty-two general practice staff (n=9 (47.4%) GPs, n=2 (100%) general practice registrars and n=11 (91.6%) practice nurses) from three practices participated in this study. Twenty-two post-intervention interviews were conducted with staff and 21 completed the open ended questionnaire. Four key themes were identified from the in-depth interviews regarding feasibility of administering MNA-SF. These themes were triangulated against the findings from the open-response questionnaire to search for disconfirming cases and refine the themes where appropriate. Most participants identified the MNA-SF as being either very helpful (n = 10) or helpful (n = 10) in identifying nutritional risk but one participant was unsure.

7.3.1 Feasibility of performing MNA-SF

Theme 1: Ease of use

The MNA-SF scoring system was viewed by participants as being able to easily categorise a patient's nutritional status. The nutrition intervention pathway also helped practitioners make decisions about how to further manage patients' nutritional status.

'With the MNA (short form), you've got more of a tool, a guideline – you've got the numbers – so if they fit into that bracket, you know that there isn't an issue. You've got a definite guideline' (PN2)

'It gave us a guideline for asking appropriate questions to identify those at risk of malnutrition whereas before we perhaps we wouldn't have known which questions to ask and how to classify the significance of their responses.' (GPR1)

Feasibility of performing MNA-SF was further described in an open ended response:

'Useful screening tool-quick and easy to use' (PN4)

'Quite efficient and provides a useful clinical indicator of nutritional risk.' (GP9)

Theme 2: Incorporation into existing practice

Practitioners provided overwhelming support for the incorporation of the MNA-SF into general practice software especially within 75+ HA templates.

'It would be better if it was integrated into our health assessment software.' (PN3)

'It just has standardised it better for me and my practice – the way we do things. It's more specific to nutritional risk than what's in the existing (75+ HA) template. There's more guidance for the person undertaking the assessment.' (GP4)

The MNA-SF was also described as being non-confrontational and similar to questions patients were being asked in the 75+HA.

'I think that most patients would have been completely unaware that they were being receiving extra screening because a lot of it involves questions we would ask anyway.' (GP1)

Open-ended questionnaire responses also supported the interview result:

'It would be better to use the MNA-SF within Best Practice Software with automatic recording of the score (but this is not currently available)' (GP1)

Practice nurses perceived MNA-SF as an ideal tool which can be fitted into a consultation:

'Easy to implement, can fit into a consultation time wise' (PN5)

'It is short and simple and doesn't take a great length of time, so it doesn't confuse or exhaust the patient with questions, also it is easy to fit it into a visit' (PN7)

Theme 3: Benefit to patients' health

The MNA-SF can also serve as a nutritional awareness strategy for older adults as it provided an opportunity for staff to broach the topic of food and dietary intake.

'Some patients you'll never think that they've got a malnutrition problem and after doing the screening you find that they are. It doesn't mean that the patient is overweight – he's well-nourished'. (GP7)

This was further described in an open ended response:

'To keep elderly patients in optimal nutritional state as it so beneficial to health and recovery. Stop elderly people "slipping through the cracks" with malnutrition and not being noticed.' (PN11)

Theme 4: Patients' perception of MNA-SF

MNA-SF was well-received by patients as it involved simple questions.

'I think they were fairly happy to participate and they were usually quite thankful for the holistic care that we're able to give. They received it quite well'. (GPR1)

Some staff expressed concern about patients being worried about the screening process and the purpose of screening, but reported that they were able to alleviate anxiety by further assurance and explanation regarding the purpose of the screening.

'I didn't have any that refused it once I explained it. Some, at first, were a little bit hesitant but once we explained just what it was about they didn't refuse it.' (PN7)

'I think there were a few times where they seemed relieved that it was only a short form I think, especially in a medical setting, often when you ask people to fill in a form they expect that it's going to be long.' (PN8)

Practitioners also highlighted that obtaining written consent as part of ethics requirement brought more concern to patients

‘Written consent in order to ask questions of patients seemed quite onerous and I think the consent itself caused more distress to patients than the actual questions.’

(GP1)

7.3.2 Feasibility of using the resource kit

Two key themes emerged regarding the usefulness of the nutrition resource kit; applicability and improvement. The resource kit was found to be ‘very useful’ (n = 3), ‘useful’ (n = 11) and ‘not sure’ (n=4) according to responses provided in the open-response questionnaire. Three participants didn’t provide any responses.

The resource kit was perceived as applicable for use in general practice.

‘I think with that resource kit I think we’ve got pretty much all that would be relevant and useful and also applicable. I think any more than that would start to complicate the process too much for this setting.’ (GP4)

‘I think it’s a great kit for not just nutritionally at risk people; I think it’s a great kit that so many people over 75 would find really helpful. Not all – some people are functioning really well and don’t need any of that assistance but yes, I thought it had some really good information in it.’ (PN8)

The main suggestion about how to further improve the kit related to availability of a shortened version provided in an electronic format that can be printed out for patients, as required, and annually updated to remain current.

“Simple – just a sheet or a downloadable thing would be better that’s on our computer that we can just print off and hand to them.” (PN2)

Responses about electronic format of the resource kit were also supported in open response questionnaires.

'Electronic copies are more useful than paper copies.' (GP1)

7.3.3 Nutrition screening knowledge scores

A statistically significant improvement in nutritional screening knowledge of general practice staff was found at the end of the three month test screening period, following training on given at baseline ($p < 0.01$) Mean score (standard deviation) improved from 5.7 (1.5) to 7.3 (1.1), whilst total score percentage increased from 51.8 % to 66.4 %.

Questions poorly answered before training related to the percentage of loss of body weight that would characterize risk of malnutrition, ideal BMI for older adults, and which oral nutrition supplements would provide an additional 400 kcal.

7.3.4 MNA-SF scores

A total of 143 older adults were screened for nutritional risk using the MNA-SF across the three participating general practices. Table 7-2 details the nutrition screening results, according to allocation of the format of MNA-SF used and practice locations. Six (4.2%) and thirty-eight (26.6%) patients were identified as 'malnourished' and 'at risk of malnutrition', respectively and 99 (69.2%) were considered to be well-nourished. Discrepancies exist between scores obtained using the self-completed and practitioner-administered versions of the MNA-SF in group 3 as five patients (12%) were misclassified. Three patients had rated themselves as at risk, but staff had rated them as being well-nourished. One patient score was in the malnourished category but staff had scored them as well-nourished. Another patient that self-rated as well-nourished had been classified by staff as being at risk. Differences in scoring were identified in weight loss and body mass index questions.

Table 7-2 Results of nutrition screening using different formats of the MNA-SF within general practices

| Clinic | Version of MNA-SF | Malnourished | At Risk | Well-nourished | Total |
|---------------------------------------|----------------------------|--------------|---------|----------------|-------|
| 1 (regional) | Electronic (iPad) | 4 | 17 | 53 | 74 |
| | | 5.4% | 23.0% | 71.6% | |
| | | | | | |
| 2 (metro) | Paper based | 2 | 12 | 13 | 27 |
| | | 7.4% | 44.4% | 48.1% | |
| | | | | | |
| 3 (rural) | Self-completed by patients | 1 | 10 | 31 | 42 |
| | | 2.4% | 23.8% | 73.8% | |
| | | | | | |
| | Paper based by staff | 0 | 9 | 33 | 42 |
| | | 0% | 21.4% | 78.6% | |
| | | | | | |
| All practices (Completed by staff) | | 6 | 38 | 99 | 143 |
| | | 4.2% | 26.6% | 69.2% | |

7.4 Discussion

We are not aware of any previous reports of studies demonstrating the feasibility of routinely using a malnutrition screening instrument (MNA-SF) among general practice staff, using a mixed methods assessment approach. General practitioners and practice nurses identified the MNA-SF as an easy-to-use, systematic and quick tool that can categorise older patients according to their nutritional risk, which is consistent with findings from other countries (Skates and Anthony, 2012, Vellas et al., 2006). The use of a validated instrument was valued as an objective way to facilitate nutritional risk identification in an open and non-threatening way. The intervention was associated with an improvement in practice capacity to identify malnutrition, indicated by an increase in knowledge scores after training and the three month trial. Practice staff identified that the six items in the MNA-SF were non-invasive and well-received by patient, which is an important criterion for a nutrition screening tool (Elia et al., 2005). Our previous research has found that older patients may not be willing to divulge information to health care professionals about their dietary behaviours or social risk factors that impact on nutritional status due to fear of potential negative consequences, such as institutionalization and loss of independence (Hamirudin et al., 2013).

General practice staff appreciated that different formats of the MNA-SF exist, either iPad- or paper based, and versions that can be self-completed by older adults or their carer. However, they emphasized that it is necessary to incorporate the MNA-SF into existing clinical software in order to integrate it into a patient's electronic medical record. This would facilitate tracking of patients' nutritional risk score over time, along with any changes in body weight. Further, electronic entry would enable direct

linking of the MNA-SF result with the recommended nutritional management pathway, thus facilitating a clear decision-making process. In addition, the MNA-SF which has high sensitivity and specificity (Rubenstein et al., 2001), is able to identify those individuals who might not be considered as at risk based on physical appearance, such as those who are obese.

While the self-completed version of the MNA-SF may be time-saving for practice staff, further investigation of its feasibility is warranted (Bauer, 2013). Our study indicates that incorrect estimation of body weight would bias the overall weighted scoring system and result in an incorrect nutritional risk assessment, as evident by score discrepancies between staff and several patients. However, the newly introduced Self-MNA has been demonstrated as having an acceptable inter-rater reliability when used by community-dwelling older adults (Huhmann et al., 2013).

It was our experience that practice nurses play a lead role in conducting routine nutritional screening in the general practice setting (Arrowsmith, 1999) and this is the group to be targeted for timely identification of malnutrition (Skates and Anthony, 2012). Higher participation rates from practice nurses than GPs likely reflect their commitment and/or capacity to undertake preventive care.

Findings from our study highlighted the benefit of nutrition education and training for general practice staff through demonstrated improvement in nutritional screening skills, knowledge and practice. In Ireland, an education programme incorporating guidance on using a validated nutrition screening tool was effective in up-skilling general practitioners and practice nurses (Kennelly et al., 2010). That programme

required dietitians to engage with general practice staff in a one hour session and to assess their knowledge, which was consistent with our approach. Another UK study identified that nutrition training led by dietitians improved practice nurses' nutrition knowledge which also contributed to being more confident in providing simple nutrition advice to patients (Cadman and Findlay, 1998). A systematic review has further identified positive dietary changes in older adults who have received nutritional advice from health care professionals (Young et al., 2011).

The nutrition resources for patients were found to be useful to deliver nutrition messages. General practice staff felt that they did not possess the necessary skills to effectively manage malnutrition and therefore felt more comfortable to hand out the nutrition resources to patients. This finding is similar to that reported more than ten years ago among Australian general practitioners (Helman, 1997) who preferred to hand out nutritional resources to patients rather than playing a key role in their nutritional management. A need to refer malnourished patients to a dietitian for further assessment and management was acknowledged. Our study did not attempt to transfer these specialised skills to general practice staff, but rather aimed to encourage greater awareness of nutrition-related issues and the need for opportunistic routine nutrition screening in all older patients.

Our findings demonstrate that malnutrition remains a problem in community-dwelling older adults attending general practice, as reported by others (Winter et al., 2013). An Australian study of home nursing service clients showed higher rates of malnutrition with 8% of older adults being malnourished and an additional 35% being categorised as 'at risk of malnutrition' (Rist et al., 2012b), while another study

of older people receiving home care services in South Australia reported a higher prevalence of nutritional risk (Visvanathan et al., 2003). Pooled global estimates using the full MNA assessment (Guigoz et al., 1996) rather than the MNA short form screen, in community dwelling older adults, indicate that 32% of this group are 'at risk of malnutrition' and 6 % are malnourished (Kaiser et al., 2010). In our study, less than 10% patients from the same age group in each general practice participated in the screening and 27% of them were identified as at risk. Both malnourished and 'at risk' community-dwelling older adults have a higher risk of hospital admissions, with longer hospital stays than their well-nourished counterparts (Visvanathan et al., 2003) which indicates that targeting the 'at risk' group to prevent further health deterioration is warranted (Watterson et al., 2009). However, implementation of nutrition screening does not reflect in improvements of patient outcomes (Weekes et al., 2009), unless patients are committed to adhere to prescribed nutrition intervention.

Preventive health is a major focus of primary health care reform in Australia, especially in older adults (Australian National Preventive Health Agency (ANPHA), 2013). General practice is recognised as an appropriate setting in undertaking timely identification of malnutrition through nutrition screening (Drenthen and Van Binsbergen, 2008). The MBS-funded health assessment for older adults aged 75 years and older (75+HA) is an initiative aimed at improving the identification and management of medical and non-medical problems (Gray and Newbury, 2004). We provide evidence that nutrition screening in older adults can become routine practice if it is incorporated within this annual health assessment (Hamirudin et al., 2013, Flanagan et al., 2012), a concept that is also advocated by international authors

(National Institute for Health and Clinical Excellence, 2006b, Elia et al., 2005). An additional opportunity is the recent (July 2012) introduction of the electronic patient health record by the Australian Department of Health (Department of Health and Ageing, 2012a). Incorporating patients' nutritional screening scores into electronic medical records would improve interdisciplinary care between general practitioners, practice nurses, dietitians and other allied health professionals, as well as allow for better communication between sectors of the health care system. Improvement in patient outcomes will further motivate implementation of nutrition screening. Older adults are susceptible to rapid nutritional decline (Volkert, 2002), especially following hospital discharge after an acute illness when they may be referred home with little nutritional support, resulting in hospital readmissions, poor quality of life and mortality (Charlton et al., 2012a, Charlton et al., 2013).

Additionally, there may be financial incentives for General Practices to incorporate nutrition screening within the 75+ Health Assessments as a means of improving holistic care for older patients within nurse-led consultations that attract Medicare rebates. Older patients contribute significantly to non-billable time for GPs. A continuous national study of general practice activity in Australia reported that 12% of patients had non-billable time spent between previous and current visits over the period of a year (Valenti et al., 2013). This can be extrapolated to a national figure of 16.3 million encounters annually, representing 2.7 million hours of GP's time or an average of 2.5 hours per week, equivalent to 8.6 standard consultations per week. This translates to a substantial loss of potential income, of approximately \$15,000 per General Practice per year. Importantly, the likelihood of non-billable patient

encounters increased dramatically with patient age and with the management of at least one chronic health condition.

Limitations to this study include a small number of health care practitioners recruited from only three general practices in a single health district using a convenience sampling technique, and a relatively short duration of the intervention period. The questionnaire that was used to assess change in knowledge of practice staff following upskilling and training was not trialled before use, which may limit its content validity, however overall score improved and it was the relative change that was important to demonstrate. The requirement by ethics to obtain written consent from patients for nutrition screening may have reduced their participation rate rather than if screening had been offered as a usual part of the model of care, however this cannot be confirmed. A strength of the research was inclusion of three practice locations from a metropolitan, regional and rural area, as well as the mixed methods approach that included qualitative as well as quantitative data. This study represents the second of a three-phase participatory, action-based research project that has been designed to improve malnutrition identification in older adults through nutrition screening and appropriate nutrition intervention in the Australian general practice setting. The first exploratory phase (Hamirudin et al., 2013) informed the model tested here, while the final phase will explore the practicality of incorporating an electronic format of the MNA-SF into clinical practice software, as well as investigate whether nutritional screening impacts on patient outcomes.

7.5 Conclusion

Implementing routine nutritional screening in general practice is feasible through the use of an easy, systematic tool, the MNA-SF provided it is accompanied with training and provision of relevant patient resources for use by general practice staff. Improvement in nutritional screening skills and knowledge can be achieved by upskilling general practice staff with practical guidance. Timely nutrition intervention for the 'malnourished' and 'at risk' group could prevent further deterioration of nutritional status. Future incorporation of the MNA-SF within general practice clinical software was viewed as the most feasible format as the screening score could be linked with patients' medical record and incorporated into annual health assessment.

7.6 Authors' contributions

AHH drafted and revised the manuscript; designed the study, collected, analysed and interpreted the data. KC, KW and AB designed the study, critically revised the data interpretation and manuscript. JP, MM, AH, GA, AG and AD designed the study and critically revised the manuscript. All authors read and approved the final manuscript. The authors declare that they have no competing interests.

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CHAPTER 8 (STUDY 5)¹⁸

STATEMENT

This thesis has been prepared in journal article compilation style format. This thesis includes chapter that has been accepted for publication in a peer-reviewed journal article:

Chapter 8:

Implementation of nutrition screening for older adults in General Practice: Patient perspectives indicate acceptability

As the primary supervisor, I Associate Professor Karen Charlton, declare that the greater part of the work in this above article is attributed to the candidate, Aliza Haslinda Hamirudin.

In the manuscript, Aliza contributed to study design and was primarily responsible for data collection, data analysis, data interpretation and writing up the manuscript. The first draft of the manuscript was written by the candidate and Aliza was then responsible for editing the suggestions of her co-authors.

Associate Professor Karen Charlton
Primary Supervisor

¹⁸ This paper has been accepted for publication in *The Journal of Aging Research & Clinical Practice*

Findings from this chapter were accepted for oral presentation at the Dietitians Association of Australia (DAA) 32nd National Conference, Perth, Australia on 13 – 16 May 2015 and poster presentation at the 5th Asia Pacific Primary Care Research Conference 2015, Putrajaya, Malaysia on 4 – 6 December 2015.

8 IMPLEMENTATION OF NUTRITION SCREENING FOR OLDER ADULTS IN GENERAL PRACTICE: PATIENT PERSPECTIVES INDICATE ACCEPTABILITY

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Abstract

Aims

This study aimed to evaluate clinical outcomes post nutrition screening and to identify the perceptions of older patients related to their experiences when undergoing the nutrition screening process.

Methods

Patients aged ≥ 75 years ($n=143$) who had participated in an initial nutrition screening were invited for repeat screening between 6 months and one year following the first screening. Those who were malnourished and at risk at baseline were invited to participate in an individual interview at follow-up to identify their perceptions of the Mini Nutritional Assessment Short Form (MNA-SF) and the usefulness of a nutrition resource kit that had been provided. Interviews were audio recorded, transcribed verbatim, coded into topics and analysed thematically

Results

Seventy-two patients (50.3%) underwent repeat screening. Nutritional status had improved in the group identified to be malnourished/at risk at baseline (MNA-SF score of 9.9 ± 1.5 vs. 11.4 ± 2.1) ($p=0.01$), while no significant changes were detected for those that were classified as well-nourished group at baseline (13.3 ± 0.9 vs. 12.8 ± 1.5) ($p=0.07$). Referral to community services predicted malnutrition risk at follow-up ($p=0.031$). Interviews indicated that the MNA-SF process itself was well-received but that patients did not perceive themselves as being in need of nutrition support.

Conclusions

Implementation of routine identification of malnutrition in older adults attending general practice can be achieved with the use of a rapid screening tool. Further deterioration in nutritional status may then be prevented by following appropriate nutrition care pathways. The MNA-SF was not perceived by older patients as being harmful, or intrusive, however motivators for older patients to improve their nutritional status warrants further exploration.

Keywords: malnutrition, older adults, nutrition screening, general practice, outcomes

8.1 Introduction

Malnutrition that develops in older adults living in community settings contributes to both increased hospital and residential care admissions (Russell and Elia, 2010). Prevalence rates of malnutrition in hospitalised older adults is higher than in younger inpatients (Imoberdorf et al., 2010), with more than 80% of hospitalised older adults being identified as 'at risk' or malnourished according to recent studies using the validated and internationally accepted Mini Nutrition Assessment classification (Holyday et al., 2012, Charlton et al., 2012a, Kaiser et al., 2010).

Malnourished older adults have a slower recovery, longer hospital stays, reduced quality of life and more frequent visits to their general practitioners (GPs) (BAPEN Malnutrition Advisory Group, 2003a). This results in increased health care costs post hospital discharge (Edington et al., 2004) and a high risk for hospital readmission (Tappenden et al., 2013). Timely identification and management of malnutrition in this age group through routine nutrition screening can prevent further deterioration in nutritional status (Skates and Anthony, 2012, National Institute for Health and Clinical Excellence, 2006b, Schilp et al., 2012). In Australia and other countries, clinical guidelines recommend performing nutrition screening in older adults across all settings, including primary health care and residential settings (Australian and New Zealand Society for Geriatric Medicine, 2009, Watterson et al., 2009, Kondrup et al., 2003, Elia and Russell, 2009).

In the UK, nutrition screening has been reported to be poorly performed in general practice (Elia and Russell, 2009). Nutrition screening uptakes have been improved since the introduction of a validated nutrition screening tool (BAPEN Malnutrition

Advisory Group, 2003b). However, much remains to be done before nutrition screening is implemented routinely in health care checks for older adults.

A lack of knowledge related to the process of nutrition screening and nutrition care pathways and a lack of appropriate patient education resources have been outlined as barriers to performing nutrition screening by Australian general practitioners and practice nurses (Hamirudin et al., 2013). Opportunities identified by practitioners include the incorporation of a nutrition screening tool within current practice, via the existing Medicare-funded Health Assessment for older persons age 75 years and older (75+ HA)(Hamirudin et al., 2013), as has been advocated by others (Flanagan et al., 2012, Visvanathan, 2009).

Implementation of nutrition screening in general practice has been demonstrated to be feasible, provided that appropriate training and resources are provided by dietitians, within a multidisciplinary approach (Hamirudin et al., 2014a). This involves the use of a validated screening tool (BAPEN Malnutrition Advisory Group, 2003a) that is accompanied by initiation of clear clinical pathways associated with the identified screening classification (Skates and Anthony, 2012). Participatory action research with Australian general practitioners has identified that an electronic format of the Mini Nutrition Assessment Short Form (MNA-SF) is the preferred version of the screening tool since it can be linked to patient medical records within existing desktop clinical software packages (Hamirudin et al., 2014a).

To date, the views of older patients themselves regarding their experiences of the screening process has not been explored. Previous studies undertaken in the general practice setting have rather focused on identification of rates of malnutrition. It is particularly important to document the experiences of those older adults identified to

be at nutritional risk, for whom care pathways are followed. Elucidation of patient perceptions will contribute to further improvement of a model of nutritional care delivery in older adults (Brotherton et al., 2011), and encourage wider uptake of nutrition screening in this age group.

A mixed methods study was performed to assess older patients' nutritional status within 6 months to 1 year following an initial nutrition screening, evaluate their clinical outcomes within that time frame, and identify older patients' perceptions of the MNA-SF, screening process and the nutrition resources that had been provided.

8.2 Methods

General practices that are members of the Illawarra and Southern Practice Research Network (ISPRN) were invited to participate in this study. Three General Practices responded and were from a regional, rural and metropolitan area within the Illawarra and Shoalhaven Medicare Local catchment area of New South Wales, Australia.

A 60 minute training and discussion session was conducted by a single dietitian with practice nurses and GPs within each practice on how to perform nutrition screening using the MNA-SF, as described elsewhere (Hamirudin et al., 2014a). A Microsoft Power Point presentation, MNA-SF video (Nestle Nutrition Institute, 2014c) and case studies were incorporated into the workshop sessions. Nutrition resource kits that had been specifically developed for use in the geographical region of each general practice were provided to practice staff for the purpose of patient education. The kits included a leaflet about high energy and high protein foods, an 'Eating Well' booklet (NSW Health, 2011), a relevant local council directory of nutrition-related services and available support services for older persons in their catchment area.

For a period of three months following completion of the training session, staff were encouraged to invite patients aged 75 years and older who were undergoing the 75+HA and those attending the practice for consultations to additionally include the MNA-SF. Patients who agreed to be screened completed a written consent form. Patients who were identified to be 'at risk of malnutrition' or 'malnourished' were provided with a resource kit and other interventions, as outlined in the MNA-SF nutrition intervention pathway guide (Nestle Nutrition Institute, 2014b).

Additionally, patients identified to be malnourished were referred to an accredited practising dietitian.

All 143 of the patients aged 75+ years who had undergone screening within this period were invited for a nutrition screening follow up visit at their General Practice within 6 months to one year of the first screening (Figure 8-1). Each patient received a personal letter outlining the results of their initial nutrition screening [Scores between 12-14 indicate 'well- nourished', 8-11 'at risk' and '0-7' as 'malnourished'] (Kaiser et al., 2009) and were invited to attend for a follow up screening interview conducted by practice nurses at the participating General Practices.

A week after the invitation letter had been sent to each patient, practice nurses followed up with an additional telephone call to arrange an appointment date. Written informed consent was obtained from all patients who agreed to participate in the follow-up. The MNA-SF was repeated using the electronic format, the results of which were incorporated into patients' electronic medical records. The electronically compatible version of the MNA-SF was formulated by a research team member from Illawarra Shoalhaven Medicare Local (AG).

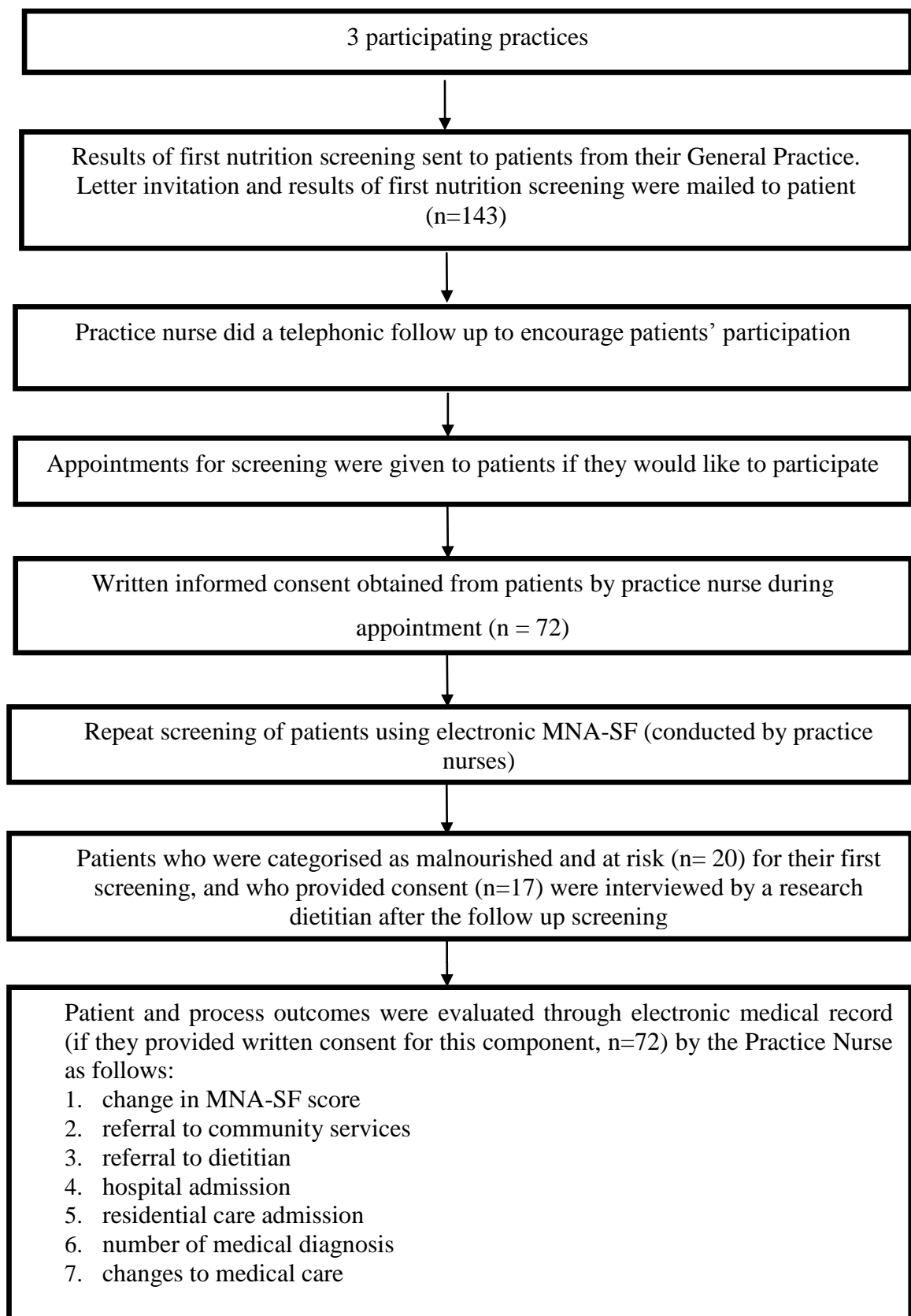
Patients who were categorised as 'malnourished' or 'at risk of malnutrition' (n=44) at their initial screen were additionally invited to participate in an individual in-depth interview. The individual interviews were performed to assess patients' perceptions of the nutrition screening process, experiences related to the MNA-SF instrument itself, and to obtain feedback on the nutrition resource kit that had been provided. An interviewer's guide (Appendix D) was developed for the in-depth interviews by three

dietitians (AHH, KC and KW) that are experienced in malnutrition and was based on open-ended questions (Tong et al., 2007). Interviews were conducted by a single dietitian researcher (AHH) on the same day as the nutrition screening follow up at each general practice. Interviews took approximately 30 minutes and were audio recorded, transcribed verbatim, coded into topics and analysed thematically using qualitative analysis software (QSR NVivo version 10). AHH conducted constant comparison for primary topics coding, whilst secondary coding and thematic analysis emerged from discussion among AHH, KC and KW.

Process outcomes since first screening were extracted from individual patient's electronic medical records by practice nurses in order to assess associations with nutritional status at follow up. Quantitative data analyses were conducted using IBM SPSS version 21. Statistical significance was set at $p < 0.05$. Wilcoxon Signed Ranks Tests were performed to analyse differences in MNA-SF score as data was not normally distributed. Predictors of being 'at risk' and 'malnourished' at follow up and other process outcomes were analysed using binary logistic regression modelling. Underlying illness, was not considered in the analysis although two of the six items in the MNA-SF® instrument address illness, including acute illness within the past three months, and the presence of neuropsychological problems (dementia, depression, etc.).

Ethics approval for the study was granted by University of Wollongong Human Research Ethics Committee (HE12/381).

Figure 8-1 Research protocol



8.3 Results

8.3.1 Results of MNA-SF score

Seventy-two patients of the initial 143 (50.3%) participated in follow up screening (Clinic 1: n= 38/74 (51.4%), Clinic 2: n= 15/27 (55.5%) and Clinic 3: n= 19/42 (45.2%)). 66.7% (n= 4/6) malnourished, 52.6% (n= 20/38) at risk and 47.5% (n= 47/99) well-nourished patients at initial screening were identified as non-participants. The MNA-SF scores for patients who completed follow-up screening are shown in Table 8-1, as categories of nutritional risk. At follow-up, 20 participants (27.8%) were identified as 'at risk'; while one patient (1.4%) was malnourished and 51 patients (70.8%) were well-nourished.

Table 8-1 Number of patients who completed both initial and follow up MNA-SF screening

| Categories | Clinic 1 (regional) (n= 38) | | Clinic 2 (metropolitan) (n= 15) | | Clinic 3 (rural) (n= 19) | |
|--------------------|--------------------------------|---------------|---------------------------------------|---------------|-----------------------------|---------------|
| | Initial screening | Follow- up | Initial screening | Follow- up | Initial screening | Follow- up |
| Malnourished | 0 | 0 | 2 | 1 | 0 | 0 |
| At risk | 7 | 15 | 7 | 5 | 4 | 0 |
| Well- nourished | 31 | 23 | 6 | 9 | 15 | 19 |
| Total | 38 | 38 | 15 | 15 | 19 | 19 |

A statistically significant improvement was found for change in mean MNA-SF score for those patients categorised as malnourished and at risk at initial screening ($p=0.01$) (Table 8-2). Although improvement in the mean total MNA-SF score was detected in the malnourished and at risk patients ($n=20$), mean score remained in the at-risk category (score $\geq 8-11$), but closer to the cut-off value that indicates a 'well-nourished' state (Table 8-2). One malnourished patient at initial screening was identified as at-risk at follow up, whilst a patient remained malnourished. 11 patients who were at-risk of malnutrition at initial screening improved to well-nourished category at follow up; nevertheless another 7 patients were still in at-risk category.

52 patients who participated in follow-up screening from all clinics were well-nourished at initial screening. No significant changes at follow up were detected in mean MNA-SF score for the group who were well-nourished at initial screening ($p=0.07$). However, 23% ($n=12/52$) of this group of patients were in at-risk category at follow up.

Table 8-2 Mean (SD) MNA-SF score based on groups

| MNA-SF Score at baseline | Initial screening | Follow-up | P value |
|--|-----------------------------------|----------------------------------|-------------|
| | Score | Score | |
| Malnourished and at risk of malnutrition ($n=20$) (MNA-SF score <11) | 9.9 ± 1.5 (Range = 6-11) | 11.4 ± 2.1 (Range = 7-14) | 0.01^{1*} |
| Well-nourished ($n=52$) (MNA-SF = 12 -14) | 13.3 ± 0.9 (Range = 12-14) | 12.8 ± 1.5 (Range = 9-14) | 0.07^1 |

¹Wilcoxon Signed Ranks Test, $*p < 0.05$

8.3.2 Results of Process Outcomes

All 72 patients provided informed consent for access to their clinical records and their data were analysed using binary logistic regression. The analysis was performed to assess the impact of factors on the likelihood that patients would be identified as malnourished or ‘at risk’ at follow up. The model contained six independent variables: community service referral, dietetic referral, hospital admission, nursing home admission, number of medical diagnosis and medical care changes. The full model containing all predictors was statistically significant, $\chi^2 (6, N= 72) = 13.0, p= 0.043$. Only referral to community services significantly predicted the likelihood of being ‘at risk’ or ‘malnourished’ at the follow up with the odds ratio of 0.19 ($p= 0.03$) (Table 3). No significant results were identified for other independent variables as predictors of being ‘at risk’ or ‘malnourished’.

Table 8-3 Logistic regression predicting likelihood of being ‘malnourished’ and ‘at risk’

| Process outcomes (n= number of occasion) | Odds ratio | 95% C.I. for Odds ratio | | P value |
|---|---------------|----------------------------|-------|---------|
| | | Lower | Upper | |
| Community Service Referral (n=15) | 0.19 | 0.04 | 0.86 | 0.03* |
| Dietetic Referral (n=7) | 1.28 | 0.13 | 12.86 | 0.83 |
| Hospital Admission (n=17) | 1.02 | 0.20 | 5.26 | 0.98 |
| Nursing home admission (n=2) | 0.00 | 0.00 | | 1.00 |
| Number of medical diagnosis (n= 0-12) | 0.86 | 0.64 | 1.16 | 0.33 |
| Medical care changes (n=22) | 0.61 | 0.15 | 2.53 | 0.50 |

* $p < 0.05$

8.3.3 Interview results

Seventeen older patients who were identified as ‘malnourished’ or ‘at risk’ in the initial screening participated in an in-depth interview (Clinic 1: n=6; Clinic 2: n=9; and Clinic 3: n= 2). Sixteen of the interviews were audio recorded, transcribed verbatim, coded into topics and analysed thematically as one interview was not recorded. Data saturation was achieved by the fifteenth interview, although all 16 interviews were analysed. Gender (Male: M, Female: F), participants’ code and, MNA-SF scores at initial screening (1st) and follow-up (2nd) describe quotes from patients in each theme.

8.3.3.1 Perspectives related to MNA-SF

Three emergent themes regarding patients’ perspectives on MNA-SF and the nutrition screening process were identified.

Theme 1: Well-received

Patients were willing to answer the items in the MNA-SF instrument, because they perceived the questions to be non-confrontational and not of a sensitive nature, and were therefore perceived to have no adverse repercussions.

‘That doesn’t worry me one iota’ (F7), (1st screen MNA-SF score = 10, 2nd screen score = 12)

The MNA-SF was perceived to be a simple tool and was thought to be beneficial for improving the nutritional care of older patients.

‘Well it’s quite simple. When you get to my age, you want things simple don’t you?’ (M1), (1st 11, 2nd 12)

'It may be beneficial to all old people I suppose to be quite honest and if things are required after that well it'd most probably be a good thing you know' (M2), (1st 11, 2nd 14)

Theme 2: Lack of concern about nutrition screening

The results of the nutrition screening process did not appear to be considered a priority for many participants. Other concerns that carried higher priority included current medical conditions.

'I don't have trouble with any of that. The trouble is if I eat too much it sits here, you know, I can't digest it so I just do what I think is right, you know, what I'm comfortable with and we have cereal for breakfast which is Plus.' (F3), (1st 9, 2nd 13)

Prioritisation of family and social issues downplayed the importance of the nutritional screening results.

'Well because of the worry I have with my son and his children, I didn't really take an awful lot of notice of it I'm afraid. I'm sorry, I should have but I didn't.' (F4), (1st 6, 2nd 7)

Categorization of being 'at risk' or 'malnourished' had no influence on patients' behaviour relating to their dietary habits. There was a perception that a decline in nutritional status was considered to be a normal part of the ageing process

'Well they can't do much. It's me getting old, tired and worried and well, you know.' (F2), (1st 7, 2nd 10)

Theme 3: Conscious about MNA-SF items

Some participants expressed disappointment with their MNA-SF score, as they believed that they were eating correctly.

'Well I couldn't understand that. When I eat properly – I feel I eat properly – I couldn't understand why...then it showed that I was malnourished.' (F5), (1st 8, 2nd 14)

Patients who were not in the well-nourished category at initial screening reported that they needed to lose weight for both aesthetic and health reasons.

'I'd like to go down a bit more because I was 100 kilos when I found out I had diabetes and I lost 25 kilos to 75 but now I've gone up again 10 so I want to go down.' (M4), (1st 9, 2nd 12)

8.3.3.2 Acceptability of Nutrition resource kit and community services

Four emergent themes regarding patient perceptions of the resource kit and community services were identified. Nine participants stated that they had not received the resource kit.

Theme 1: Supports not required

Fourteen participants perceived that nutrition supports were not required. Participants felt that they were eating the right types of food and did not require any additional information about services to further improve their nutritional status. This reflected a desire for independence.

'I don't need it. No, we look after ourselves as far as cooking and eating is concerned. I think common sense has got a lot to do with it. I am cutting down a

little on the amount of red meat we eat but I decided that by myself. Well, we don't need so much red meat. We eat a lot of chicken' (F6), (1st 10, 2nd 10)

'Not really. I know what to eat.' (F2), (1st 7, 2nd 10)

In addition, community-based services such as Meals on Wheels (MOW) were not considered to be a choice for the time being, as patients felt that they could still prepare their own food and expressed a desire to retain their independence.

'I have tasted the food, yes, but it's quite nice but...Not at the moment. Not at the moment while I can do things myself. (M1), (1st 11, 2nd 12)

Some patients expressed a dislike of oral nutrition supplementation (ONS), because of bad experiences of their peers.

'I don't like it. I'd rather be dead' (F10), (1st 11, 2nd 9)

Theme 2: Existing clients of services

Clients of MOW (n=2) reported that they found the service as helpful, particularly as a standby on days when extra assistance was required, whilst five of them had previously seen a dietitian.

'We've got some in the fridge at the moment but I say to them for a sort of emergency when I can't be bothered cooking. If I get too tired or something happens to prevent me doing what I planned to do and then we do that, we use those; they're a stand-by really.' (M6), (1st 11, 2nd 11)

Few patients reported receiving home-help services for assistance with household chores and activities of daily living; and transitional care service when discharged home from hospital. One patient was a carer to an unwell spouse.

'My husband's fully assessed (diagnosed with cancer) so we can have whatever we need doing and I do have a home help comes in once a fortnight for kitchen, bathroom, toilet.' (F9), (1st 11, 2nd 11)

Theme 3: Disregard of information provided

Information that was provided was disregarded.

'I didn't follow it. No, I didn't actually – she (practice nurse) told me what cereal to take in the morning but I tried it – one plateful but I couldn't eat it. (F4), (1st 6, 2nd 7)
'Well, I haven't sat down to read them because I don't have enough vision for reading.' (F3), (1st 9, 2nd 13)

Patients also felt comfortable in continuing to do things their own ways, rather than taking the advice of a dietitian.

'Well yes, when X came out of hospital after the cancer operation we saw a dietitian about two or three times. As I said, the advice she gave us, well-meaning, but I didn't consider it all that helpful.' (M6), (1st 11, 2nd 11)
'I've found that any advice from the dieticians isn't all that helpful. It just confuses things really – I feel anyway.' (F10), (1st 1, 2nd 9)

Theme 4: Informative

Patients who had received the resource kit mentioned that it was informative, comprehensive and useful.

'It's quite informative, very good.' (M5), (1st 11, 2nd 11)
'I thought they were very good. Yes, very informative.' (F5), (1st 8, 2nd 14)

Carer to patients perceived the kit as helpful to improving patients' nutritional status.

'It would probably be more helpful to us. Yes, to read it to make sure that we can follow as many of these guidelines, suggestions that are outlined in the booklets.'

(Son of F8), (1st 11, 2nd 9)

Patients who didn't receive the resource kit were not reluctant to obtain new information on nutrition and community services, when the kit was shown to them during interview. They felt that the information may help them with their current needs.

'If I get that book well that will help...things in there that don't occur to me.' (F4),
(1st 6, 2nd 7)

'I'd like to have that one.' (M4), *(1st 9, 2nd 12)*

8.4 Discussion

This study demonstrated that nutrition screening, followed up with appropriate referral and/or nutrition intervention within one year was associated with improved nutritional status of older patients' who were at risk of malnutrition, or malnourished at an initial screen. A mixed-methods approach provides a greater understanding in health care services research than using a single method (Wisdom et al., 2012), and is an important way to explore a previously unknown phenomenon. This is necessary to improve nutrition service delivery model particularly in general practice as nutrition screening in older adults is not currently routine practice (Hamirudin et al., 2013).

Just over a quarter of patients (28 %) that were screened in three Australian general practices were identified to be at risk of malnutrition, a figure consistent with our previous work (Hamirudin et al., 2014a) and international reports (Ülger et al., 2010, Kaiser et al., 2010), but higher than that reported in another Australian study conducted in a different state (Winter et al., 2013). Some patients in the present study remain malnourished and at risk due to 'anorexia of aging'; characterised by underlying illness and physiological changes in aging (Ahmed and Haboubi, 2010). Weight loss and loss of appetite are recognised as key contributors to this phenomenon in older adults (Soenen and Chapman, 2013). Studies investigating older adults in receipt of home care services have reported higher malnutrition prevalence figures (Visvanathan et al., 2003, Rist et al., 2012b, Söderhamn et al., 2012), whilst age has been recognised as a factor of higher malnutrition rate in free-living elderly aged 90 years and above (Ji et al., 2012). In general practice settings, the prevalence of malnutrition in older adults has been shown to increase with advancing age

(Schilp et al., 2012). Thus, ongoing monitoring of the nutritional status of older adults is important. Our study showed that 23% of those patients who were identified as well-nourished at the initial screening were in the at risk of malnutrition group within a year. This clearly demonstrates that annual nutrition screening is recommended for all older patients, and this is in accordance with the MNA-SF guidelines (Nestle Nutrition Institute, 2014b).

Only referral to community services predicted the likelihood of being ‘malnourished’ and ‘at risk’ in the sample by the end of the study. This is clinically plausible as patients are generally referred when self-care is found to be problematic. The available local community services included help at home, such as domestic assistance, personal care, respite service and activities of daily living (ADL)(Shoalhaven City Council, 2014, Wollongong City Council, 2014, Shellharbour City Council, 2014). Receiving home help (Tomstad et al., 2012b) and declining ADL status (Izawa et al., 2014) are strong predictors of being malnourished. Meanwhile, hospital admission is associated with a 1.8 fold increased risk of being undernourished (Izawa et al., 2014), but was not identified as a significant factor in our study, possibly due to a short follow up period.

This study demonstrated that the MNA-SF was well-received among older patients in Australian general practices and that the MNA-SF questions were viewed as non-threatening by those who took part. However, most participants had little concern about improving their nutritional status, especially those with chronic diseases, those who were carer to an ill spouse, or those experiencing social or family difficulties.

Although some patients had been seen by dietitians, making dietary changes is ultimately an individual decision. Low self-perceived health status has also been associated with malnutrition risk(Söderhamn et al., 2012) and this was apparent as some participants felt that nothing could be done to improve their nutritional status due to their underlying current health conditions. It is evident that awareness about the adverse consequences of being malnourished should be emphasised to community dwelling older adults, because of a higher risk of hospital admission and longer hospital stay (Visvanathan et al., 2003), along with a more than threefold mortality rate post hospital discharge, when compared to their well-nourished peers (Charlton et al., 2012a). However, it should be noted that knowledge does not equate to behaviour change, as environmental aspects may play a major role to drive behaviour and dietary modifications such as access to food, ability to shop, financial resources, social factors and support services(Sampson, 2009, Soenen and Chapman, 2013).

In Australia, dietetic intervention is covered by Medicare Benefit Schedule (MBS) if patients are referred under a General Practice Management Plan (GPMP) or a Team Care Arrangement (TCA) (Medicare Australia, 2014). However, an Australian study reported that general practitioners initiated dietetic referral for patients who were willing to modify their eating behaviour and could afford to pay additional charges (Pomeroy and Cant, 2010). In this study, patients' financial constraints may be a contributor for not referring some malnourished and at risk patients to a dietitian if they are not eligible for GPMP and TCA schemes.

Interviews with fourteen malnourished and at risk patients suggested that they did not perceive a need for additional information and nutrition support as they felt that they already knew how to eat well and look after themselves. A previous Australian study indicated that 56% of at risk community dwelling older adults refused a dietetics referral (Leggo et al., 2008), further emphasising the difficulty in engaging this group, and a need for other strategies. Identified approach to addressing malnutrition is involvement from multidisciplinary health professional (Burge and Gazibarich, 1999). Another strategy recommended by nutrition experts to achieve successful nutrition intervention in older people is a specifically developed resource kit for local area (Bauer et al., 2010); which has been applied in this study. However, patients' willingness to change is a major factor to improving their nutritional status although the resource kit was perceived as being informative by five patients who received the resource kit in this study. These interviews aimed to gain rich insights from a sample of patients by using a qualitative method to further explore their views, perceptions and experiences with this model of care. This allowed a deeper and necessary understanding of how they perceived the screening and follow up so that pragmatic recommendations for future use at these practices, and in future research studies could be articulated.

Meals on Wheels (MOW) was not considered to be a desirable option for fourteen participants in the current study, which is consistent with another Australian study(Charlton et al., 2012b) although the service has been demonstrated to improve nutritional status in its clients (Keller, 2006). Only two participants in the present study were clients of MOW services and both found it to be useful. A Danish study demonstrated that the use of MOW is higher among at risk and malnourished patients

than well-nourished elderly, which demonstrates its targeted approach in addressing the need for nutrition services in the community (Beck et al., 2001a). It can be concluded that medical conditions, personal issues and life experiences were considered by this age group to be more important priorities than addressing their nutritional status.

8.4.1 Limitations and future research

This research involved a convenience sample of only three general practices and included a convenience sample of patients. Due to 50% drop out rate in our study which contributed to a small sample size, our results couldn't be generalised to older adults' population. Data on patients' financial status was not collected as this was considered outside the scope of this study. In addition, reasons for healthcare practitioners' referral were not investigated in this present study. A well designed randomised controlled trial with a longer duration of intervention is needed to test our findings. Further investigation into older adults' nutritional needs and motivation to change is warranted as older adults appeared to be comfortable with their current dietary patterns, despite being identified as malnourished or at risk of malnutrition.

8.4.2 Implication

The MNA-SF can be widely used in general practice, whilst nutrition intervention and relevant resources can improve patients' nutritional status. Annual nutrition screening is strongly recommended for older adults to ensure optimum nutritional status. Practice nurses can play a leading role in performing nutrition screening in the general practice setting as has been modelled in this study with support from general practitioners and dietitians.

8.4.3 Conclusion

This pre-post study has demonstrated that the MNA-SF[®] can be implemented in older adults attending general practice. Practice nurses can play a leading role in performing nutrition screening in the general practice setting as has been modelled in this study with support from GPs and dietitians. Nutrition screening, accompanied by, timely dietetics referral and provision of relevant resources to patients may be associated with improved nutritional status in this age group however this needs to be tested using a more rigorous study design that includes a control group. Our study contributes to the practice based guidelines that recommend annual nutrition reviews in community-dwelling older adults aged 65 years and older. Patients were accepting of the MNA-SF, however translational research is needed to further test this model of care and to develop implementation strategies to improve uptake of appropriate nutrition support by older patients, once identified as being at nutritional risk.

8.4.4 Acknowledgement

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8.4.5 Authors' contribution

AHH drafted and revised the manuscript; designed the study, collected, analysed and interpreted the data. KC, KW and AB designed the study, critically revised the data interpretation and manuscript. JP, MM, AH, GA, AG and AD designed the study and critically revised the manuscript. All authors read and approved the final manuscript.

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CHAPTER 9 SUMMARY AND CONCLUSION

9 SUMMARY AND CONCLUSION

9.1 Summary of the research

The body of work presented in this thesis has demonstrated that the implementation of nutrition screening for older adults attending General Practice, following dietitian-led training and upskilling of General Practitioners and Practice Nurses, is both feasible and potentially beneficial to patient outcomes. An action-based participatory research process was undertaken to engage General Practice staff, and to direct the development of appropriate nutrition screening models of care. This involved compilation of nutrition resource kits, procedures and referral forms for referring 'at risk' and malnourished patients to a dietitian, as well as electronic adaptation of the MNA[®]-SF to be incorporated into the existing Medicare-funded 75+ Health Assessment (75+HA) screen for the participating general practices. A strength of the research method is that both process and impact evaluations were undertaken as each stage of the study unfolded. A further strength is the use of a mixed methods approach that included both qualitative and quantitative methodologies.

Study 1 demonstrated that the nutritional status of older adults could potentially be improved post hospital discharge through personalised dietetic intervention offered at home. However the weak study design that did not include a control group limits further interpretation regarding the efficacy thereof. Study 2 which was performed in three general practices in a regional area of Australia, explored and identified barriers and opportunities to implementing nutrition screening. Two key findings from this study were that a lack of time was a key barrier and that General Practice staff perceived the greatest opportunity for nutrition screening to be within the 75+ HA.

The findings from study 2 informed the further investigations included in Study 3, 4 and 5. Study 3 explored the uptake of the 75+HA screen in the Illawarra Shoalhaven Local Health District (which is where the general practice studies were conducted), compared to both the state of New South Wales and Australia as a whole, for the decade following its introduction in 1999. Study 3 was conducted to identify potential uptake of nutrition screening within the 75+ HA. Although a low uptake of the health screen was evident, trends showed encouraging evidence of an increased uptake over the years; which also suggests opportunities of nutrition screening uptake over the next years if it is incorporated within the 75+ HA. The increased 75+HA uptake may reflect a better awareness among older adults and general practice staff to engage in preventive activities.

Study 4 is central to the study hypothesis as it highlighted that it is feasible, in a busy practice-based environment, to introduce routine nutrition screening in older adults using the validated MNA[®]-SF instrument. Valuable feedback received from GPs and practice nurses using qualitative methods confirmed this. Following training on how to use the MNA[®]-SF, a quasi experimental trial was conducted over 3 months. Thirty percent of the target group of older adults attending general practice who were screened were identified to be either malnourished (MNA[®]-SF score of 0-7) or at risk of malnutrition (MNA[®]-SF score of 8-11). Further follow up of these malnourished and at risk patients was conducted in study 5 to monitor and evaluate their health outcomes within six months to one year of their first nutrition screening. Significant improvements in the nutritional status of patients were demonstrated. Individual, in-depth interviews with patients highlighted positive feedback related to their personal experiences of nutrition screening with the MNA[®]-SF and the applicability of the

nutrition resource kit that was made available to them. A notable finding was that the majority of these patients did not perceive themselves to be at risk of inadequate dietary intake, with many feeling that they were eating well. This highlights a lack of awareness related to the role of nutrition on health outcomes in older age.

Consequently, malnutrition identification through nutrition screening has an important role to play as a routine component of general practice for older patients aged ≥ 65 years. However, performing nutrition screening without appropriate follow-up and development of nutrition care plans is unhelpful and not a valid use of general practice staff time. Our research proposes a new model of care in which nutrition is central within other preventive healthcare monitoring activities. As articulated by others (Weekes et al., 2009), nutrition screening needs to be accompanied by nutrition intervention and dietetics referral, provided within a well defined nutrition care plan, that may include follow-up through a dietetics referral.

This PhD thesis demonstrated that a multi disciplinary approach that includes general practitioners, practice nurses and dietitians is essential to ensure better nutrition service delivery models in community living older adults. Monitoring the nutritional status of older adults' over time is encouraged through repeat nutritional screening as outlined by the nutrition intervention pathway (Nestle Nutrition Institute, 2014b). The MNA[®]-SF which is the most valid nutritional screening tool for community-living older adults (Phillips et al., 2010) was well received among both general practice staff and older patients. It is an easy, quick, valid and practical tool that can be used across all settings for easy tracking of nutritional status (Skates and Anthony, 2012). A consistent approach using the same tool is beneficial to patients'

understanding about any changes in their nutritional status. A self-administered version of the MNA[®]-SF as trialled by Huhmann et al. (2013) can be completed by patients themselves or their carer, and the results can be discussed with general practitioners for further evaluation.

Training sessions that were guided by dietitians on nutrition screening assisted the knowledge and skills of general practice staff regarding nutritional status, dietetics intervention and referral. It is imperative that an interdisciplinary approach be adopted, in order to improve communication for optimal patient outcomes and efficiency of clinical practice (Jensen et al., 2013). Nutrition resources are best kept precise, locally relevant (e.g. reference made to locally available meal services and contact details of local practitioners) and concise for the benefit of staff, patients and carers.

9.2 Implications for practice

Nutrition screening of older adults can be implemented in community based settings, where the vast majority of the older population lives. Older adults attend general practitioners more frequently than other sectors of the population (Britt et al., 2013a). During the year 2011-2012, older Australian adults aged 65-69 years had an average of eight GP visits and this number was even higher in older age groups (Valenti et al., 2013). Given their frequent contact with general practice, this is an ideal location for the monitoring of nutritional status and referral to dietitians.

The convalescence period at home following hospital discharge is a critical time of transitional care between health care settings and is an important time to focus on dietary intakes. Thus, a continuous process of nutrition screening, assessment, intervention and monitoring post hospital discharge to identify any changes in nutritional status is advocated. Clear communication and links between hospital and community settings is an essential step to improve the nutritional status of older adults. However, a fully integrated health care information system is not yet implemented in Australia whereby patient care processes and outcomes can be evaluated between hospital and community settings; this is particularly so within general practice settings (Britt et al., 2013a). A recently launched patient centered electronic health (eHealth) record may likely be a starting point for this process evaluation, as it enables participating health care organisations to retrieve patient information through this integrated system (Department of Health and Ageing, 2012a).

It is strongly recommended that mandatory nutrition screening and intervention policies are implemented across all health care and residential settings in order to improve quality of life and reduce the burden on hospital healthcare system (Elia et al., 2010). In other countries, nutrition screening is suggested to be included as part of the accreditation for general practices (Elia and Russell, 2009). General practice can be a central point for preventive activities to improve patient outcomes (The Royal Australian College of General Practitioners, 2006), as it has been recognised as the initial patient encounter with health care services in the community (Sampson, 2009). It is also a key role of practice nurses to undertake preventive health care

activities; incorporation of nutrition screening into routine clinical practice with support from GPs fits within this domain (Skates and Anthony, 2012).

Malnutrition often develops in community settings and a high risk of malnutrition has been shown to be present in up to 45% of sectors of the population in Australia (Visvanathan et al., 2003, Rist et al., 2012b). These figures highlight a need for appropriate action to be taken to prevent further nutritional decline in a timely manner (Elia et al., 2010). Incorporation of the MNA[®]-SF into general practice software has been demonstrated as the most effective format to encourage its use within general practice staff (Hamirudin et al., 2014a). Implementation of routine nutrition screening and nutrition intervention in this setting has also been proven by others to be successful with support from dietitians, cooperation from community health care professionals and appropriate resources (Kennelly et al., 2010).

9.3 Limitations, strengths and future research

Studies within this PhD thesis involved convenience samples drawn from hospital and general practice settings. Evaluation of the nutritional status, post hospital discharge, was undertaken using a case study approach in a sample of Department of Veterans' Affairs (DVA) clients. Hence, the findings cannot be generalised to the older Australian population who may have less access to services and may experience less in-home support. In that study, all nutrition assessments and interventions were performed by a single dietitian, which minimised inter-observer bias. The provision of home-based personalised dietetic intervention for a period of three months improved patients' nutritional status, although this group of older adults

received a unique and extensive support package that was generously funded through the DVA. These clients have privileged access to a greater range of health care services through DVA health card arrangements compared to general population (Department of Veteran's Affairs, 2014) and could therefore be expected to be better able to avail themselves of preventive health services (Department of Veteran's Affairs, 2013), including nutrition-related ones. This suggests that non-DVA clients would gain even greater benefit if they were offered this type of home-based dietetic care, as has been highlighted by others regarding continuity of care in community setting after hospital discharge (Robinson et al., 2011, Beck et al., 2013). A local Community & Outpatient Nutrition Extended Care Team (CONNECT) is an initiative for outpatient dietetic care service which was proven successful in this region (Nichols, 2008). Although randomised control trial is considered as a high level of ranking of evidence (NHMRC, 2012), it is unethical to have a control group of at risk or malnourished individuals without active interventions. Given this, a quasi experimental study design was chosen for this study.

The general practice-based studies were conducted in three partnering practices that were conveniently sampled from a regional, rural and metropolitan area within the Illawarra and Shoalhaven region of New South Wales, Australia. Despite having different patient catchment areas with differing sociodemographic characteristics, the three practices cannot be considered to be representative of general practices within the region, state or country. However, it should be noted that recruitment of general practices was conducted within the Illawarra and Southern Practice Research Network and that the three practices responded to participate. Although higher number of general practice participation is generally ideal for research purposes, the

predominantly participatory and qualitative nature of the research methodology required in-depth analysis in a small number of practices, as a starting point. Within each practice, participation of GPs and practice nurses was voluntary, therefore it is possible that implementation of the nutrition screening process may have been better in this sample of interested volunteers than it may have been if a whole-of-practice approach to analysis had been undertaken. Nevertheless, general practice staff involvement to undertake research within their usual working hours requires high commitment to recruit older adults as participants and subsequently obtain meaningful results. Further, it is acknowledged that the sample did not include practices from larger inner city areas or more remote areas. Despite of that, findings of at risk patients in study 4 and 5 are consistent with global findings (Kaiser et al., 2010). The notable strength of these studies is the use of a participatory action based research approach, and inclusion of both quantitative and qualitative research methodology in studies 2, 4 and 5.

It became evident early in the research project that the most promising opportunity for implementing nutritional screening was within the existing annual health assessment for older persons aged 75 years and older (75+HA). However, data regarding the uptake of 75+HA from May 2010 onwards was difficult to obtain due to changes in the Medicare item numbers that resulted in data being presented in time-based units rather than age group-related codes. The other health assessment screens that were later included in the revised Medicare Benefit Scheme (MBS) coding system, along with the 75+HA, include one available for children aged 4 years, as well as a chronic disease-related screen for Aboriginal and Torres Strait Islanders aged 55 years and older. Combining these health screens into a single

MBS code makes it impossible to track trends in the uptake of the 75+HA alone. Future collaborative work between Medicare Australia and health care researchers through a data sharing agreement is an identified strategy to demonstrate health assessments uptake according to age groups since the changes was introduced in May 2010.

Recruited patients from participating general practices were followed up between 6 months and one year following their initial screening, in order to evaluate the outcomes related to the nutrition screening and associated intervention. MNA[®]-SF scores showed positive improvements over this period of time and the process was well-accepted by patients. However, a well designed randomised controlled trial with a longer duration of intervention is needed to further test the findings and confirm the applicability of the nutrition model of care.

Even so, older adults did not perceive a need for nutrition information to improve their nutritional status, as they believed they were eating well, even those who were identified as at risk or malnourished. The older adults included in our studies were confident that they knew how to maintain their nutritional status and look after themselves. A fear of losing their independence as a result of poor nutritional status may also have influenced their perceptions about lack of a need for nutrition information. Future research about the perceptions and needs of older adults regarding nutrition information/care and factors that influence their motivation to modify their dietary intake are warranted.

9.4 Conclusion

Nutrition screening, assessment, intervention and monitoring is a cyclical process. These components were included in the model of nutritional care that was developed and tested in this thesis, and that facilitated improvements in the nutritional status of older adults living at home. The nutrition service delivery model that has been investigated throughout this thesis requires a multidisciplinary approach that includes dietitians, general practitioners and practice nurses to improve the nutritional status of older adults. A challenge remains to implementing and sustaining this model of nutritional care as routine practice, and in engaging those older patients considered to be at nutritional risk or malnourished but who do not perceive themselves to be disadvantaged.

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APPENDIX A MINI NUTRITION ASSESSMENT-SHORT FORM (MNA-SF)



Mini Nutritional Assessment MNA®

| | | | | |
|------------|------|-------------|-------------|-------|
| Last name: | | First name: | | |
| Sex: | Age: | Weight, kg: | Height, cm: | Date: |

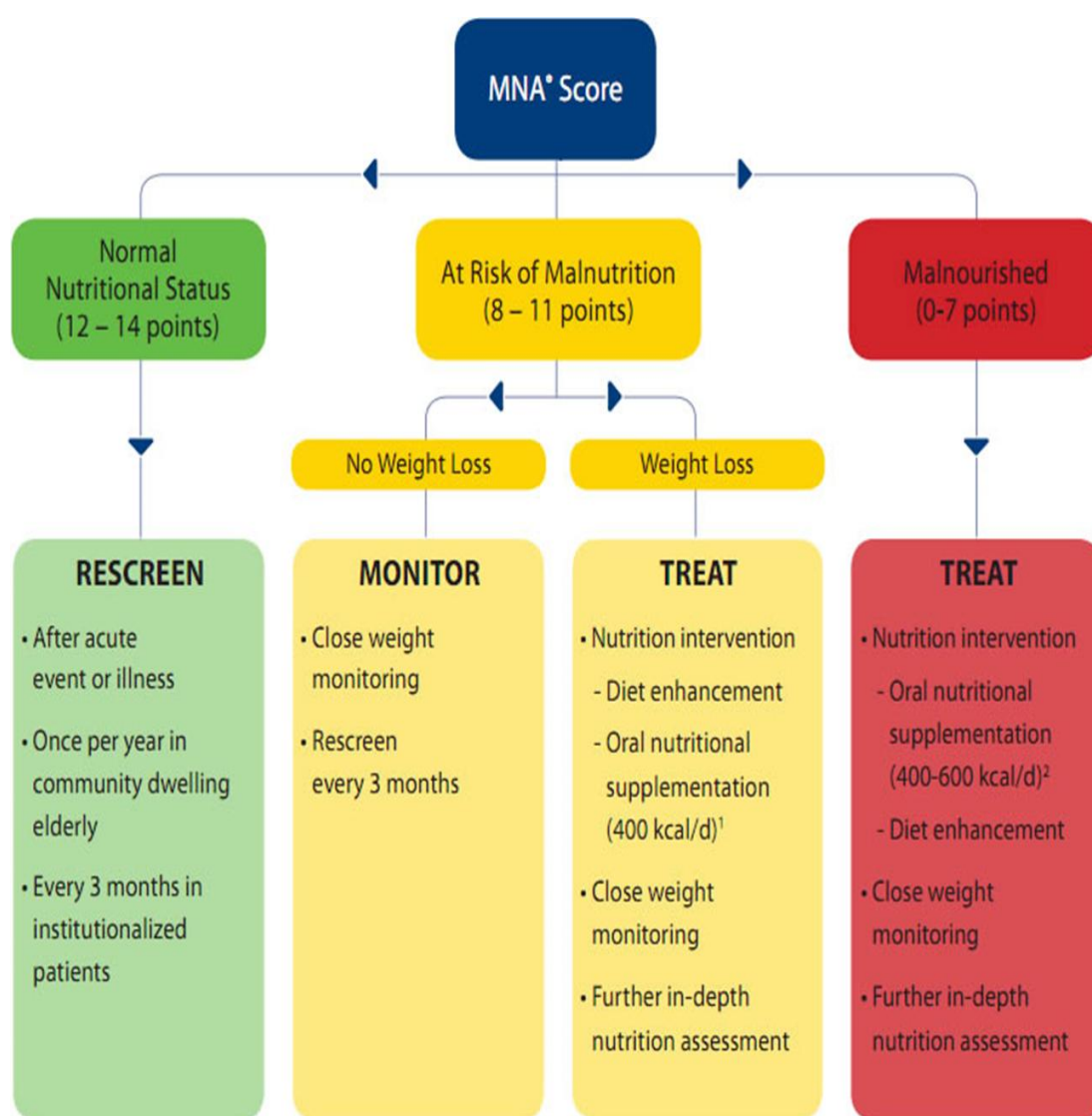
Complete the screen by filling in the boxes with the appropriate numbers. Total the numbers for the final screening score.

| Screening | |
|---|---|
| A Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties? 0 = severe decrease in food intake 1 = moderate decrease in food intake 2 = no decrease in food intake | <input type="checkbox"/> |
| B Weight loss during the last 3 months 0 = weight loss greater than 3 kg (6.6 lbs) 1 = does not know 2 = weight loss between 1 and 3 kg (2.2 and 6.6 lbs) 3 = no weight loss | <input type="checkbox"/> |
| C Mobility 0 = bed or chair bound 1 = able to get out of bed / chair but does not go out 2 = goes out | <input type="checkbox"/> |
| D Has suffered psychological stress or acute disease in the past 3 months? 0 = yes 2 = no | <input type="checkbox"/> |
| E Neuropsychological problems 0 = severe dementia or depression 1 = mild dementia 2 = no psychological problems | <input type="checkbox"/> |
| F1 Body Mass Index (BMI) (weight in kg) / (height in m²) 0 = BMI less than 19 1 = BMI 19 to less than 21 2 = BMI 21 to less than 23 3 = BMI 23 or greater | <input type="checkbox"/> |
| IF BMI IS NOT AVAILABLE, REPLACE QUESTION F1 WITH QUESTION F2. DO NOT ANSWER QUESTION F2 IF QUESTION F1 IS ALREADY COMPLETED. | |
| F2 Calf circumference (CC) in cm 0 = CC less than 31 3 = CC 31 or greater | <input type="checkbox"/> |
| Screening score (max. 14 points) | <input type="checkbox"/> <input type="checkbox"/> |
| 12-14 points: Normal nutritional status 8-11 points: At risk of malnutrition 0-7 points: Malnourished | |

For a more in-depth assessment, complete the full MNA® which is available at www.mna-elderly.com

Ref. Vellas B, Villars H, Abellan G, et al. Overview of the MNA® - its History and Challenges. J Nutr Health Aging 2006; 10:455-465.
 Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. Screening for Undernutrition in Geriatric Practice: Developing the Short-Form Mini Nutritional Assessment (MNA-SF). J Geront 2001; 56A: M366-377.
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 © Nestlé, 1994, Revision 2009, N67200 12/99 10M
 For more information: www.mna-elderly.com

APPENDIX B MNA-SF CARE PATHWAY



1. Milne AC, et al. *Cochrane Database Syst Rev.* 2009;2:CD003288 2. Gariballa S, et al. *Am J Med.* 2006;119:693-699
© Nestec S.A 2009

APPENDIX C MULTIPLE CHOICE QUESTIONNAIRES USED IN STUDY 4

(Answers are highlighted in blue)

Please Tick ONE answer for each question

1. What information is needed to calculate older people's Body Mass Index (BMI)?
 - ☐ Age in year, weight in kg and height in cm
 - ☐ Weight in kg and height in cm
 - ☐ Age in year, weight in kg and height in m
 - ☒ Weight in kg and height in m
 - ☐ Not sure

2. What type of diet is the most suitable to older people if they are at risk of malnutrition?
 - ☐ Diet high in energy
 - ☐ Diet high in protein
 - ☐ Diet high in unsaturated fat
 - ☒ Diet high in energy and protein
 - ☐ Not sure

3. Which is the most well validated nutrition screening tool for older people?
 - ☐ Malnutrition Screening Tool (MST)
 - ☐ Malnutrition Universal Screening Tool (MUST)
 - ☒ Mini Nutrition Assessment- Short Form (MNA-SF)
 - ☐ Subjective Global Assessment (SGA)
 - ☐ Not sure

4. Unplanned weight loss of _____% in the last 3 to 6 months is a clinically significant loss of body weight in older people.
- ☐ 5
 - ☒ >10
 - ☐ >3
 - ☐ 3- 5
 - ☐ Not sure
5. What is an optimal Body Mass Index (BMI) range for older people?
- ☐ 20– 25 kg/m²
 - ☐ 18.5– 24.9 kg/m²
 - ☒ 22- 27 kg/m²
 - ☐ 25- 30 kg/m²
 - ☐ Not sure
6. Which one of the following **is not** a protein rich food?
- ☐ Milk
 - ☐ Beans/ legumes
 - ☐ Fish
 - ☒ Honey
 - ☐ Not sure
7. Which of the following is a risk factor for malnutrition in older people?
- ☐ Living alone
 - ☐ Financial restraints
 - ☐ Recent bereavement
 - ☐ Acute illness
 - ☒ All of the above

8. Oral nutritional supplements such as Ensure® or Sustagen® can be useful to increase energy intake for people with poor appetite. 200 calories/ 840 kJoules can be obtained from the following:
- ☐ 2 scoops (40 g) Sustagen® or 5 scoops (45 g) Ensure® with 200 ml of water
 - ☐ 4 scoops (80 g) Ensure® or 4 scoops (36 g) Ensure® with 200 ml of water
 - ☒ 3 scoops (60 g) Sustagen® or 6 scoops (54 g) Ensure® with 200 ml of water
 - ☐ 2.5 scoops (50 g) Sustagen® or 4.5 scoops (50 g) Ensure® with 200 ml of water
 - ☐ Not sure
9. Which of the following snacks would provide 500 kJoules/120 calories and 5 grams of protein?
- ☐ Half egg sandwich (70 g)
 - ☐ Biscuits and cheese (30g)
 - ☐ Fruit yoghurt (175g)
 - ☐ Flavoured milk (150mL)
 - ☒ All of the above
10. A patient has had a Mini Nutrition Assessment-Short Form performed. The score places them in the “at risk of malnutrition” category but they report no weight loss. What is the correct management?
- ☐ Referral to dietitian
 - ☒ Rescreen in 3 months
 - ☐ Rescreen in 6 months
 - ☐ Prescribe nutrition supplement
 - ☐ All of the above

11. What is the recommended frequency of conducting a 75+HA for somebody aged ≥ 75 years?

- ☐ Only when indicated from clinical history
- ☐ At every visit
- ☒ Once a year
- ☐ Every 3 years
- ☐ Don't know

APPENDIX D INTERVIEW GUIDE USED IN STUDY 5

1. What do you think about the nutrition screening instrument being used in this project, the MNA-SF? (How did you find the screening process?)
2. How do you feel about your nutrition screening score?
3. Could you please describe the nutrition advice provided to you?
4. Could you please describe what influence the score had on your dietary intake afterwards?
5. How do you feel about your body weight?
6. How is your appetite?
7. Who does the shopping and the cooking?
8. Do you eat out?
9. What do you think about the resource kit previously provided to you (a sample will be available to refer to)?
10. Were any resources useful to improve your nutrition status? (showing each of the resources- 'Eating Well' booklet, 'High Energy and High Protein' food list, resources from council). If so, which ones?
11. Are there other types of resources or advice that would be helpful about food and nutrition?
12. Do you use any other nutrition related services (e.g. frozen meals from supermarket, MOW, shopping services or meals at the local club?)
13. What do you know about the 75+ Health Assessment? What do you think about the annual Health Assessment for older persons aged 75 years and older (75+ HA)?
14. Do you have any other questions or comments?

Thank you for your time

APPENDIX E AUSTRALIAN NUTRITION SCREENING INITIATIVE (ANSI)

The Australian Nutrition Screening Initiative (ANSI) - 12 point checklist

Lipski, PS (1996), Australian Nutrition Risk Screening Initiative, *Australian Journal on Ageing* 15:141

| Question | Score |
|--|-------|
| I have an illness or condition that made me change the kind and/or amount of food I eat. | 2 |
| I eat fewer than two meals per day. | 3 |
| I eat few fruits, vegetables, or milk products. | 2 |
| I have three or more glasses of beer, liquor, or wine per day. | 2 |
| I have tooth or mouth problems that make it hard for me to eat. | 2 |
| I don't always have enough money to buy the food I need. | 4 |
| I eat alone most of the time. | 1 |
| I take three or more different prescribed or over-the-counter drugs a day. | 1 |
| Without wanting to, I have lost or gained 5 kilograms in the last 6 months. | 2 |
| I am not always able to shop, cook and/or feed myself. | 2 |

| Total Score | Nutritional Risk |
|-------------|---------------------------|
| 0 – 2 | Good nutritional health |
| 3 – 5 | Moderate nutritional risk |
| 6 or more | High nutritional risk |

APPENDIX F MALNUTRITION SCREENING TOOL (MST)

Malnutrition

Is your patient at risk?

Malnutrition Screening Tool¹

1. Have you / the patient lost weight recently without trying?

No 0

Unsure 2

Yes, how much (kg)?

1 - 5 1

6 - 10 2

11 - 15 3

> 15 4

Unsure 2

2. Have you / the patient been eating poorly because of a decreased appetite?

No 0

Yes 1

Total Score

Applies to the last 6 months

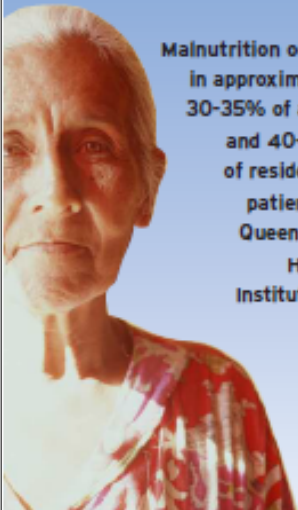
Of weight loss and appetite questions

if unsure, ask if they suspect they have lost weight e.g. clothes are looser

For example, less than 3/4 of usual intake

May also be eating poorly due to chewing and swallowing problems

If your patients have lost weight and / or are eating poorly they may be at risk of malnutrition i.e. score 2 or more




Malnutrition occurs in approximately 30-35% of acute and 40-45% of residential patients in Queensland Health Institutions²

Action

1. **Refer** to Malnutrition Action Flowchart and / or refer to Dietitian for full assessment and intervention
2. **Document**
3. **Weigh** patients on admission and:
 - (a) weekly (acute)
 - (b) monthly (long-term care)
4. **Rescreen** patients:
 - (a) weekly (acute)
 - (b) monthly (long-term care)

Small weight losses weekly add up to significant weight loss and malnutrition

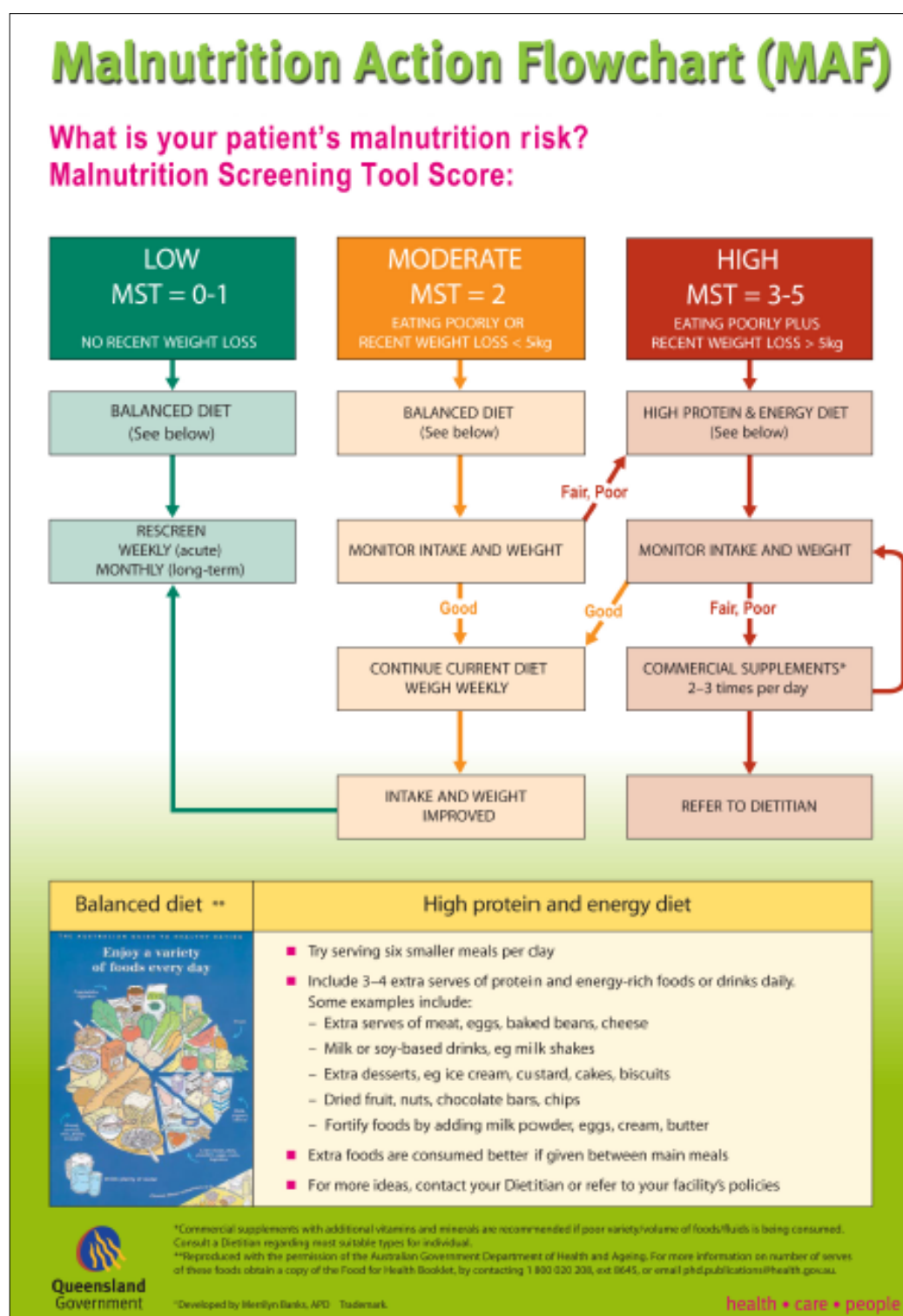
Note: Overweight / obese patients who have unexplained weight loss and illness can become protein depleted / malnourished too



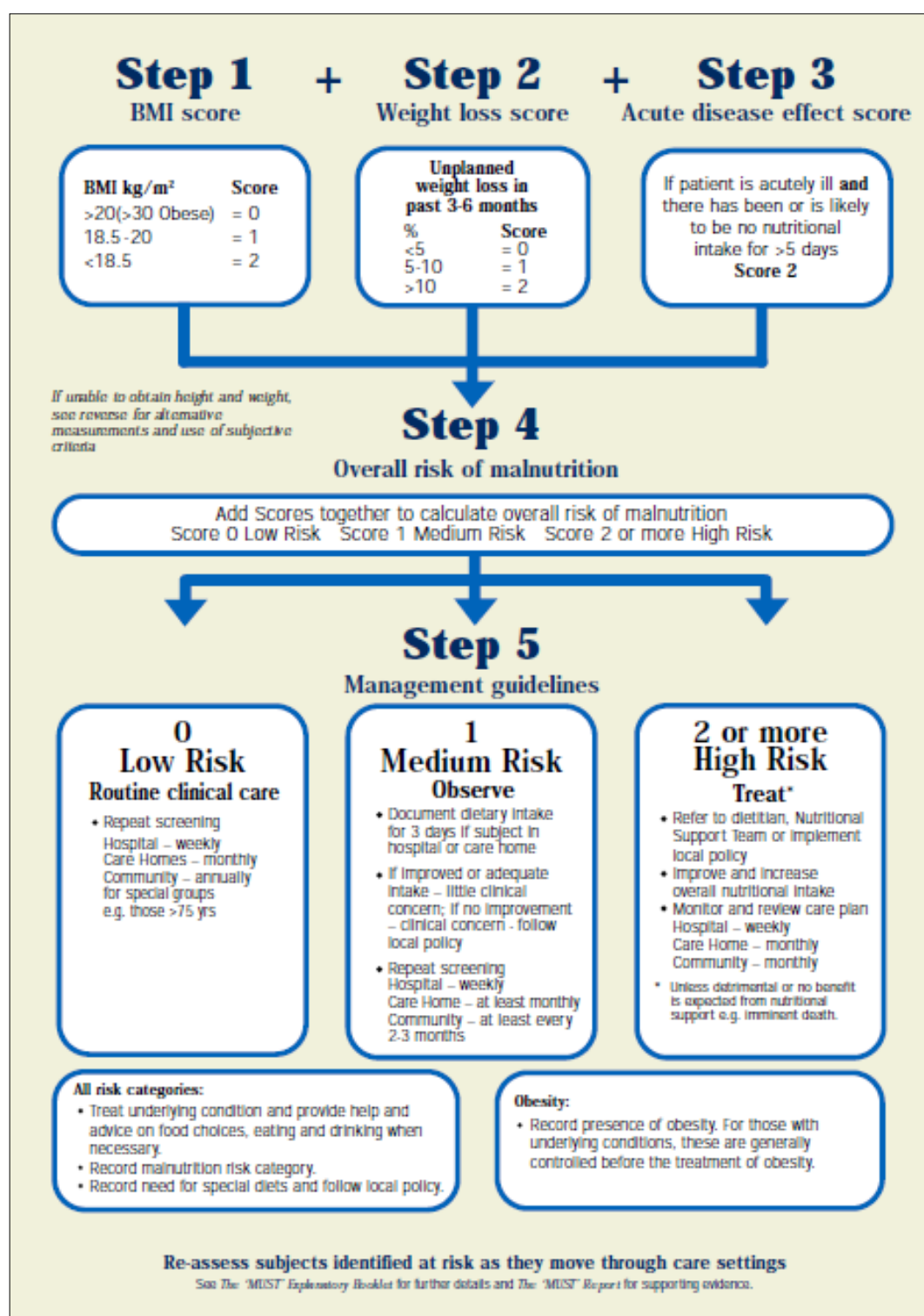
© Developed by Memilyn Banks, APD with assistance from Abbott

References: 1. Ferguson M, et al. *Malnutrition* 1999 15:456-464. 2. Banks M, et al. *Malnutrition and Pressure Ulcers in Queensland Hospitals: Proceedings of 22nd National GNA Conference*, Melbourne 2004. Abbott Australia Pty Ltd. ABN 95 000 180 380. Custom Cook Drive, Kurnell NSW 2231. Ph 1800 225 311. TM Trademark. The Health Agency NUT001-04/04.

APPENDIX G MALNUTRITION SCREENING TOOL (MST) CARE PATHWAY



APPENDIX H MALNUTRITION UNIVERSAL SCREENING TOOL (MUST) AND ITS CARE PATHWAY



APPENDIX I NUTRITION SCREENING INITIATIVE (NSI) DETERMINE CHECKLIST

The warning signs of poor nutritional health are often overlooked. Use this checklist to find out if you or someone you know is at nutritional risk.

Read the statements below. Circle the number in the yes column for those that apply to you or someone you know. For each yes answer, score the number in the box. Total your nutritional score.

Determine Your Nutritional Health

| | YES |
|---|-----|
| I have an illness or condition that made me change the kind and /or amount of food I eat. | 2 |
| I eat fewer than two meals per day. | 3 |
| I eat few fruits or vegetables, or milk products. | 2 |
| I have three or more drinks of beer, liquor or wine almost every day. | 2 |
| I have tooth or mouth problems that make it hard for me to eat. | 2 |
| I don't always have enough money to buy the food I need. | 4 |
| I eat alone most of the time. | 1 |
| I take three or more different prescribed or over-the-counter drugs a day. | 1 |
| Without wanting to, I have lost or gained 10 pounds in the last six months. | 2 |
| I am not always physically able to shop, cook and/or feed myself. | 2 |
| TOTAL | |

Total your nutritional score. If it's --

- 0-2 **Good!** Recheck your nutritional score in 6 months.
- 3-5 **You are at moderate nutritional risk.**
See what can be done to improve your eating habits and lifestyle. Your office on aging, senior nutrition program, senior citizens center or health department can help. Recheck your nutritional score in 3 months.
- 6 or more **You are at high nutritional risk.** Bring this checklist the next time you see your doctor, dietitian or other qualified health or social service professional. Talk with them about any problems you may have. Ask for help to improve your nutritional health.

Remember that warning signs suggest risk, but do not represent diagnosis of any condition. Turn the page to learn more about the Warning Signs of poor nutritional health.

APPENDIX J NUTRITION FOR FORM ELDERLY (NUFFE)

| | | POINTS | | | |
|---|---|---|--|---|---|
| 1 | Unintentional weight loss (regardless of time & magnitude) <div style="display: flex; justify-content: space-between;"> <div> <input type="checkbox"/> BMI is less than 20 (69 years or younger) <input type="checkbox"/> BMI is less than 22 (70 years or younger) Height/weight cannot be obtained, measure calf circumference (2b) </div> <div> Yes, weight loss = 2 No weight loss = 0 Don't know = leave empty and continue </div> </div> | | | | |
| 2a | <input type="checkbox"/> BMI is less than 20 (69 years or younger) <input type="checkbox"/> BMI is less than 22 (70 years or younger) Height/weight cannot be obtained, measure calf circumference (2b) | Low BMI or small calf circumference = 1 Otherwise = 0 | | | |
| 2b | <input type="checkbox"/> Calf circumference is less than 31 centimeters | | | | |
| 3 | Eating problems (mark with check on left and score according to instructions on right) Food intake <input type="checkbox"/> Difficult to maintain good sitting position during meals <input type="checkbox"/> Difficulty manipulating food on plate <input type="checkbox"/> Difficulty conveying food to mouth | One/more problems = 1 No problems = 0 | | | |
| 4 | Swallowing/mouth <input type="checkbox"/> Difficulty chewing <input type="checkbox"/> Difficulty coping with food in mouth <input type="checkbox"/> Difficulty swallowing | One/more problems = 1 No issues = 0 | | | |
| 5 | Energy/appetite <input type="checkbox"/> Eats less than 3/4 of food served <input type="checkbox"/> Lacks energy to complete an entire meal <input type="checkbox"/> Poor appetite | One/more problems = 2 No problems = 0 | | | |
| 6 | Clinical signs indicate risk of undernutrition. Assess e.g. body morphology, subcutaneous fat, muscle mass, grip strength, edema (fluid retention), blood tests (e.g. serum albumin) | Clinical signs indicate risk = 1 Otherwise = 0 | | | |
| Tally observations 1–6 (min = 0, max = 8) | | TOTAL: | | | |
| RISK OF UNDERNUTRITION <input type="checkbox"/> 0–2 points, no or low risk <input type="checkbox"/> 3–4 points, moderate risk <input type="checkbox"/> 5 points or more, high risk | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; vertical-align: top;"> Gradation of high BMI <u>Overweight:</u> 25–29.9 (69 years or younger) 27–31.9 (70 years or older) <input type="checkbox"/> </td> <td style="width: 33%; vertical-align: top;"> <u>Obesity:</u> 30–39.9 (69 years or younger) 32–41.9 (70 years or older) <input type="checkbox"/> </td> <td style="width: 33%; vertical-align: top;"> <u>Severe/morbid obesity:</u> > 40 (69 years or younger) > 42 (70 years or older) <input type="checkbox"/> </td> </tr> </table> | | | Gradation of high BMI <u>Overweight:</u> 25–29.9 (69 years or younger) 27–31.9 (70 years or older) <input type="checkbox"/> | <u>Obesity:</u> 30–39.9 (69 years or younger) 32–41.9 (70 years or older) <input type="checkbox"/> | <u>Severe/morbid obesity:</u> > 40 (69 years or younger) > 42 (70 years or older) <input type="checkbox"/> |
| Gradation of high BMI <u>Overweight:</u> 25–29.9 (69 years or younger) 27–31.9 (70 years or older) <input type="checkbox"/> | <u>Obesity:</u> 30–39.9 (69 years or younger) 32–41.9 (70 years or older) <input type="checkbox"/> | <u>Severe/morbid obesity:</u> > 40 (69 years or younger) > 42 (70 years or older) <input type="checkbox"/> | | | |

APPENDIX K SCREEN®I

Name _____

Date _____



SCREEN

Interviewer Version

INSTRUCTIONS

Use the interviewer version of SCREEN when older adults are not able to complete the questionnaire on their own. Speak slowly and clearly. Ask the respondent to provide the single best answer to each of the 15 questions. You may have to repeat the question and the possible answers for some seniors. Check the response and enter the response number into the Item Score . Add up Item Score for the 15 items to determine the Total Score.

INTERVIEWER STATEMENT TO RESPONDENT

I am going to ask you 15 questions about your eating habits. Each question has several possible answers. Please tell me which answer is most correct for you right now. Ask me to repeat the question and possible answers if you are unsure.

1. How many foods do you limit or avoid because of a health condition or because they disagree with you?

None _____4
One or two _____3
Quite a few _____2
Enough to make it hard to eat with others _____1
Enough to make your diet very restricted _____0

ITEM SCORE

2. How often do you usually eat...

At least three times each day _____4
At least three times a day, five or six days a week _____3
At least three times a day, three or four days a week _____2
Two times each day _____1
Less than two times a day _____0

ITEM SCORE

3. How many times a day do you eat fruits or vegetables (canned, fresh, frozen, or juice)?

Five or more _____4
Four _____3
Three _____2
Two _____1
Less than two _____0

ITEM SCORE

APPENDIX K SCREEN®I

4. How many times do you eat meat, eggs, fish, poultry or meat alternatives (such as dried peas, beans, lentils, nuts, or tofu)?

Two or more times each day ____4
Once each day ____3
Five or six times a week ____2
Three or four times a week ____1
Less than three times a week ____0

ITEM SCORE

5. How often do you drink milk or eat foods made with milk (such as cheese, yogurt, milk, pudding)?

Two or more times each day ____4
Once each day ____3
Five or six times a week ____2
Three or four times a week ____1
Less than three times a week ____0

ITEM SCORE

6. How many cups (250 ml.) of fluid do you drink each day (tea, coffee, water, juice, milk, or soft-drinks)?

Five or more ____4
Four ____3
Three ____2
Two ____1
Less than two ____0

ITEM SCORE

7. How often do you find it hard to bite or chew food?

Never ____4
Rarely ____3
Sometimes ____2
Often ____1
Always ____0

ITEM SCORE

8. How often do you choke, cough or have pain when you swallow food or fluids?

Never ____4
Rarely ____3
Sometimes ____2
Often ____1
Always ____0

ITEM SCORE

9. When you are alone, how often do you eat good, healthy meals?

Never ____0
Rarely ____1
Sometimes ____2
Often ____3
Always ____4
I rarely eat alone ____4

ITEM SCORE

APPENDIX K SCREEN®I

10. How often do you take meal replacements or drink supplements?

Never ___4
Rarely ___3
Sometimes ___2
Often ___1
Always ___0

ITEM SCORE

11. Is your appetite usually...

Very good ___4
Good ___3
Fair ___2
Poor ___1
Very poor ___0

ITEM SCORE

12. Do you agree with the following statement? "I have enough money to buy the food need".

Strongly agree ___4
Agree ___3
Don't agree or disagree ___2
Disagree ___1
Strongly disagree ___0

ITEM SCORE

13. If you do your own cooking, how often do you find it difficult (physically, lack interest, stressful, lack skill)?

Never ___4
Rarely ___3
Sometimes ___2
Often ___1
Always ___0
Doesn't do own cooking ___4

ITEM SCORE

14. If you do your own grocery shopping, how often do you find it difficult (physically, lack transportation, poor weather, lack of interest, or stressful)?

Never ___4
Rarely ___3
Sometimes ___2
Often ___1
Always ___0
Doesn't do own shopping ___4

ITEM SCORE

APPENDIX K SCREEN®I

15. Has your weight changed in the past 6 months?



WEIGHT HAS NOT CHANGED ___4

DOES NOT KNOW IF WEIGHT HAS
CHANGED ___0

How much has your weight changed?

More than 10 pounds ___0

6-10 pounds ___1

2-5 pounds ___2

Less than 2 pounds ___3

ITEM SCORE

Total Score

Scores can range from 0 to 60. The higher the score, the better the eating habits of the senior.

Interpreting SCREEN (see the Guide for further details)

Total Score greater than or equal to 50

Total Score less than 50

A score of 0 on the *weight change* question

A score of 1 or 0 on the *swallowing food* question

A score of 1 or 0 on the *appetite* question

Senior is not at risk. Monitor.

Refer to dietitian or physician.

Refer to dietitian or physician.

Refer to dietitian or physician.

Refer to dietitian or physician.

Date referral made: _____ To: _____



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APPENDIX L SCREEN® II



SCREEN II
Score

Rate your eating habits.

Name:

Date:

- For each question, check **only one** box that describes you **best**.
- Your response should reflect your **typical eating habits**.
- Feel free to write **comments** beside any question.

1a. Has your weight changed in the past 6 months?

- ₄ ☐ No, my weight stayed within a few pounds.
- ₀ ☐ I don't know how much I weigh or if my weight has changed.

Yes, *I gained ...*

- ₀ ☐ more than 10 pounds *Comments?*
- ₁ ☐ 6 to 10 pounds
- ₂ ☐ about 5 pounds

Yes, *I lost ...*

- ₀ ☐ more than 10 pounds
- ₁ ☐ 6 to 10 pounds
- ₂ ☐ about 5 pounds

1b. Have you been trying to change your weight in the past 6 months?

- ₄ ☐ Yes
- ₄ ☐ No
- ₀ ☐ No, *but it changed anyway*

1c. Do you think your weight is ...?

- ₀ ☐ more than it should be
- ₄ ☐ just right
- ₀ ☐ less than it should be

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APPENDIX L SCREEN® II

2. Do you skip meals?

- ☐ 4 Never or rarely
- ☐ 3 Sometimes
- ☐ 1 Often
- ☐ 0 Almost every day

3. Do you limit or avoid certain foods?

- ☐ 4 I eat most foods.
- ☐ 2 I limit some foods and I am managing fine.
- ☐ 0 I limit some foods and I am finding it difficult to manage.

4. How would you describe your appetite?

- ☐ 4 Very good
- ☐ 3 Good
- ☐ 2 Fair
- ☐ 0 Poor

5. How many pieces or servings of fruit and vegetables do you eat in a day?

Fruit and vegetables can be canned, fresh, frozen, or juice.

- ☐ 4 Five or more
- ☐ 3 Four
- ☐ 2 Three
- ☐ 1 Two
- ☐ 0 Less than two

6. How often do you eat meat, eggs, fish, poultry, OR meat alternatives?

Meat alternatives are dried peas, beans, lentils, nuts, peanut butter, tofu.

- ☐ 4 Two or more times a *day*
- ☐ 3 One to two times a *day*
- ☐ 1 Once a *day*
- ☐ 0 Less than once a *day*

APPENDIX L SCREEN® II

7. How often do you have milk products?

Examples are fluid milk, cooking with milk, milk puddings, ice cream, cheese, yogurt, and milk alternatives like fortified soy beverages.

₄ ☐ Three or more times a day

₃ ☐ Two to three times a day

₂ ☐ One to two times a day

₁ ☐ Usually once a day

₀ ☐ Less than once a day

8. How much fluid do you drink in a day?

Examples are water, tea, coffee, herbal drinks, juice, and soft drinks, but not alcohol.

₄ ☐ Eight or more cups

₃ ☐ Five to seven cups

₂ ☐ Three to four cups

₁ ☐ About two cups

₀ ☐ Less than two cups

9. Do you cough, choke or have pain when swallowing food OR fluids?

₄ ☐ Never

₃ ☐ Rarely

₁ ☐ Sometimes

₀ ☐ Often or always

10. Is biting or chewing food difficult for you?

₄ ☐ Never

₃ ☐ Rarely

₂ ☐ Sometimes

₀ ☐ Often or always

APPENDIX L SCREEN® II

11. Do you use commercial meal replacements or supplements?

Shakes, puddings, or energy bars

₄ ☐ Never or rarely

₂ ☐ Sometimes

₀ ☐ Often or always

12. Do you eat one or more meals a day with someone?

₀ ☐ Never or rarely

₂ ☐ Sometimes

₃ ☐ Often

₄ ☐ Almost always

13a. Who usually prepares your meals?

☐ I do.

☐ I share my cooking with someone else.

☐ Someone else cooks most of my meals.

13b. Which statement best describes meal preparation for you?

₄ ☐ I enjoy cooking most of my meals.

₂ ☐ I *sometimes* find cooking a chore.

₀ ☐ I *usually* find cooking a chore.

₄ ☐ I'm *satisfied* with the quality of food prepared by others.

₀ ☐ I'm *not satisfied* with the quality of food prepared by others.

14. Do you have any problems getting your groceries?

Problems can be poor health or disability, limited income, lack of transportation, weather conditions, or finding someone to shop.

₄ ☐ Never or rarely

₂ ☐ Sometimes

₁ ☐ Often

₀ ☐ Always