Final Report for the Rural Research Capacity Building Program (2007 Intake)

Will including the Malnutrition Screening Tool (MST) score on selected Upper Hunter Hospital nursing ward lists increase MST completion and improve the identification of patients at risk for malnutrition?

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Table of Abbreviations

ACAT	Aged Care Assessment Team
APD	Accredited Practising Dietitian
CAP	Clinical Applications Port program
DAA	Dietitians Association of Australia
HNEAHS	Hunter New England Area Health Service
ICU	Intensive Care Unit
IRCST	Institute of Rural Clinical Services and Teaching
LOS	Length of Stay
MNT	Medical Nutrition Therapy
MST	Malnutrition Screening Tool
SGA	Subjective Global Assessment

Abstract

Will including the Malnutrition Screening Tool (MST) score on selected Upper Hunter Hospital nursing ward lists increase MST completion rates and improve the identification of patients at risk of malnutrition?

This study tests the effectiveness of implementing a malnutrition screening tool on rates of malnutrition screening, and detection in elderly patients admitted to hospital in a rural area and the impact on timeliness of provision of Medical Nutrition Therapy (MNT).

A time series design was used to assess changes in practice before and after the introduction of the MST score on the nursing ward list and daily contact by an Accredited Practising Dietitian (APD) for MST scores. There were 142 patients (>60yrs) from hospital wards at five sites in the Upper Hunter who participated in the study. All participants had the same data on MST score, Subjective Global Assessment (SGA), referrals to APD from MST, distribution of nutritional supplements and Length of Stay (LOS) recorded. A chi-squared test was performed to examine whether results were different between groups. Measurements for 76 patients were collected before the intervention and 66 patients in the after group.

When hospitals had the MST included on the nursing ward lists there was a 43% (χ^2=31.25, df=1, p<0.001) increase in MST completion rate and 22% (χ^2=13.89, df=1, p<0.001) increase in referrals to the APD secondary to MST score results. Referrals increased from 7% to 57% (χ^2=16.05, df=1, p<0.001) for patients with malnutrition as identified by SGA score of B or C. The provision of supplements also increased in intervention group by 25% (χ^2=11.03, df=1, p<0.001) for total patients and 71% (χ^2=21.16, df=1, p <0.001) for malnourished patients. The data did not indicate any difference in LOS between the two groups.

Adding the MST score to the nursing ward list and the practice of the APD contacting ward to determine scores was found to be effective in increasing completion of MST by nursing staff, increasing referrals to the APD for patients at risk for malnutrition and increasing provision of appropriate MNT for those shown to be at risk.

The research demonstrated that collaboration between the APD and nursing staff can lead to effective implementation of a systems approach to identifying and treating malnutrition in a vulnerable rural population where services are limited.

Executive Summary

Implications

The success of the studied change in practice of malnutrition screening suggests that adding the Malnutrition Screening Tool (MST) to the nursing ward list and an Accredited Practising Dietitian (APD) contacting the ward for screening scores should be added to the Upper Hunter Cluster Nutrition Screening protocol.

Raising awareness of malnutrition risk factors and benefits of timely Medical Nutrition Therapy (MNT) through education of staff involved in the screening process is effective in increasing the identification of malnourished patients and implementation of MNT for these patients.

The research demonstrated that collaboration between the APD and nurses can lead to effective implementation of a systems approach to identifying and treating malnutrition in a vulnerable rural population where services are limited.

The increase in identification of malnourished patients in Upper Hunter hospitals has increased demand for the APD to manage these patients. To ensure malnourished patients receive timely MNT a budget that allows the APD to cope with this increased workload and time to provide regular education to nursing and hospital staff on malnutrition screening is needed. This may include using a nutrition assistant to help in the identification and provision of MNT for malnourished patients.

Results

The change in malnutrition screening practice resulted in a number of key findings. These may be summarised as follows:

- This study was able to demonstrate that the change in screening practice instigated by the APD was successful in improving the completion rates of the MST by nursing staff in Upper Hunter hospitals. The increase was 43% for the intervention group and the completion rate increased to 94%.
- There was an increase in referrals to the APD for patients identified with malnutrition by 54%.
- There was an increase in the provision of nutritional supplements by 71% for malnourished patients being admitted to hospital. This occurred within one to three days for these patients. Previously many of these malnourished patients were not receiving timely nutrition therapy with many not receiving any nutrition therapy.
- Prevalence of malnutrition in Upper Hunter hospitals was 39% for hospital patients over the age of 60 years. This result is similar to those found in Australian hospital studies.

Context

The MST was implemented in all Upper Hunter hospitals in early 2007. The aim of including the MST is to ensure that all patients admitted to hospital in the Upper Hunter Cluster (excluding patients under 60 years of age, Intensive Care Unit (ICU), mental health patients and patients with hospital admission less than 48 hours) are screened for their risk of malnutrition, and a clinically appropriate intervention is implemented for each patient identified with increased malnutrition risk.

This research was initiated due to the low referral rates received by the APD from Upper Hunter hospitals for patients with malnutrition. Following an audit at two hospital sites it was noted that MST completion rates were poor. With studies showing the incidence of malnutrition for elderly hospital patients in Australia being 12-55% [5-6,9,12,14,16,18-21] a possible explanation was that large numbers of malnourished patients in Upper Hunter hospitals were not being identified with malnutrition and as a result, not receiving appropriate MNT while in hospital.

In current practice in the selected study hospitals the APD sees patients with malnutrition very regularly, but who have not been previously identified through the use of a malnutrition screening tool even though they may have been hospitalised for some time already. They are often referred towards the end of hospital stay or not seen during admission at all. Being missed on the screen means their length of stay is potentially longer, their rehabilitation period lengthens, they experience more medical complications directly due to malnutrition and/or they need to have more costly care or medical procedures.

For best patient care and outcomes, it is therefore important to quickly identify and act on any patients admitted with malnutrition.

This study aimed to determine whether the new malnutrition screening procedure of adding the MST score to the nursing ward list and APD contacting the wards for MST scores would improve malnutrition screening rates and MNT interventions for these malnourished patients.

Approach

The study was a time series design to assess the impact in malnutrition screening on practice before and after the intervention. Five Hospitals within Upper Hunter Cluster were used as sites to recruit participants. These were Denman, Merriwa, Murrurundi, Muswellbrook and Scone Hospitals.

The pre-intervention and post-intervention groups had the same measurements performed. These were MST score performed by nursing staff, nutritional status assessed using the Subjective Global Assessment (SGA) and supplement provision for participants monitored by researcher.

The intervention involved education for nursing staff on the change in practice of MST protocol in which MST score was added to nursing ward list and the dietitian contacting the ward daily to obtain MST score. Data was collected and analysed for 76 people in the pre-intervention group and 66 people in the post-intervention group. Chi-square analysis was used to determine association between selected variables.

Further Research

To continue the effectiveness of malnutrition screening in Upper Hunter and overcome the challenges posed by the rural issues of low APD staffing, inability to cope with increased referrals of malnourished patients and lack of nutrition assistant position a number of strategies and research needs to be investigated. These include:

- Surveying nursing and support staff involved with malnutrition screening to determine their satisfaction with change in MST practice.
- Researching malnutrition awareness amongst hospital staff. This may highlight reasons for poor malnutrition identification and documentation by hospital staff.
- Investigating different levels of automatic supplements for patients at risk of malnutrition. Patients with higher MST scores may benefit from increased provision of supplements and inclusion of supplements as part of medication round.
- Researching LOS data for malnourished patients. This could include re-examination of participant's medical diagnosis and identifying those patients who had longer LOS for whom nutrition status had no effect such as patients waiting for a nursing home bed.
- Researching the role and benefits of using a nutrition assistant or diet aide in malnutrition screening and treatment.
- Studying the effect on patient outcomes such as complications and weight change for those receiving MNT as a result of MST score.

Background

Malnutrition Screening

Malnutrition is well recognised to be associated with increased length of hospital stay, increased complications, increased hospital costs and increased mortality[1-7]. Malnutrition can also cause an impaired immune response, impaired muscle and respiratory function, longer rehabilitation times and delayed wound healing [8]. By identifying malnutrition early, appropriate and timely nutrition intervention can be implemented which may assist in improving clinical outcomes [5,9] and reducing hospital costs.

The Malnutrition Screening Tool (MST) was used in this study due to its effectiveness for use in hospital settings [2]. The tool is also currently used as part of the Upper Hunter Cluster nursing assessment form. The MST is a simple and quick tool that has been validated for use in Australian hospitals to identify malnutrition risk for patients [2,5]. The MST consists of two questions on recent unintentional weight loss and recent food intake or appetite [10].

Malnutrition screening is part of routine patient management in all Upper Hunter Cluster hospitals and approved by Upper Hunter Cluster Quality Improvement Committees and Senior Executive Management (Upper Hunter Nutrition Screening protocol, appendix 1).

The nutritional status for all participants in the research study will be assessed using the Subjective Global Assessment (SGA). This is a validated method of nutritional assessment based on the features of a medical history and physical examination [5]. The SGA ranks a patients nutritional status into one of three categories, which are well nourished (A), moderate or suspected malnutrition (B), and severe malnutrition (C) [11].

The MST and SGA were the assessment tools chosen to use in this research project as they have both been validated in Australian hospital populations and quoted in literature over the last eleven years across Australia [2,5,12-18]. This allows data from this project to be benchmarked with data from other Australian hospitals. Please see appendix 2 and 3 for copies of the MST and SGA.

Prevalence of Malnutrition in Hospital Settings

In Australian studies malnutrition has been shown to occur in 12−55% of inpatients aged above 60 years in hospital [5-6,9,12,14,16,18-21]. This is similar to malnutrition prevalence in overseas studies of 19-59% [11,22-26]. Banks et al (2007) in a large study of over 2200 acute patients and 800 aged care residents into the prevalence of malnutrition in adults health services in QLD, found that approximately 30% of acute patients and 50% of aged care residents had malnutrition as indicated by SGA score of B or C [12]. They also found that patients over 80years of age had a higher risk for malnutrition compared to those patients aged 61-80 years [12].

The prevalence of malnutrition can reflect patient's nutrition status before their hospital admission, with malnutrition screening often performed within 24-48 hours of hospital admission. Studies have shown high prevalence in patients identified as malnourished or at risk of malnutrition, on admission to hospital [23]. Malnutrition prevalence has also been recorded in the community by Visvanathan et al (2003).

Their study of 250 domiciliary clients aged 67-99 in Australia found that that 38.4% of clients were at risk for malnutrition with a further 4.8% malnourished [27].

This study will also determine whether the prevalence of malnutrition is similar to those in other studies carried out in metropolitan and teaching hospitals. A study comparing prevalence of malnutrition in tertiary hospitals compared with general hospitals found that prevalence was 5.9% higher in the tertiary hospitals [22].

Unrecognised Malnutrition

Of concern in treating malnutrition is that those at risk for malnutrition are largely unrecognized and untreated [5,9] and therefore many malnourished patients are not referred for nutrition support [18]. There is poor recognition by medical staff of malnutrition and its risk factors documented in patient medical notes for these patients [16,19]. Lazarus and Hamlyn (2005) found in their study that only 15.3% of patients with malnutrition had been referred for nutritional intervention and only 1 out of 137 patients identified with malnutrition had malnutrition documented in the medical records by a medical practitioner [18].

Some other examples of evidence for poor referral rates include:

- Adams et al (2008) who found that only 52% of patients in their study with reduced appetite and 19% of patients experiencing weight loss were detected by health professionals as being malnourished. Further only 9% of these patients with poor appetite and 7% of patients with recent weight loss were referred to the Accredited Practising Dietitian (APD) [19].
- Edington et al (2000) in a study of four hospitals in the UK, found that only 41 out of 168 (25%) malnourished patients were referred to an APD [22].

Hospitals patients requiring nutritional care generally receive this treatment from hospital APDs who rely on medical and nursing staff for referrals. With many malnourished or patients at risk for malnutrition not being identified by medical and nursing staff, these patients do not receive the opportunity for appropriate nutritional care, APD assessment and nutritional support [12,28]. Patients with under-nutrition are often undetected and only diagnosed with under-nutrition when presenting with other medical problems [29]. Lack of nutrition screening and poor knowledge of malnutrition by health professionals are possible reasons for these problems [24].

The main reasons for poor screening rates by nursing staff include insufficient time, lack of staff, poor understanding of malnutrition risk factors and complacency towards malnutrition [19,28,30-31]. These can lead to inconsistent and incomplete screening [30].

In one survey of health staff on knowledge of risk factors for malnutrition, weight loss and poor appetite it was demonstrated that staff had a good knowledge of malnutrition risk factors but poor knowledge of major risk factors such as recent unintentional weight loss and poor appetite [19].

Improving nutrition screening policies around nutritional screening and education for hospital staff on the identification and documentation and benefits of treatment for patients at risk for malnutrition may reduce the incidence of unrecognised malnutrition [19].

Consequences of Malnutrition

There are many consequences that result from malnutrition in hospital. These include:

- Increased hospital costs with longer hospital stays [1-3,5].
- Increasing the length of stay for inpatients with several studies indicating that patients identified as at risk for malnutrition or malnourished had a longer Length of Stay (LOS) than those patients not at risk [2,5,21-22].
- Higher complication rates [4,6-7]. These complications, including wound infections and pneumonia can result in increasing LOS [4]. Patients longer LOS were also more likely to have more infections [22].
- Higher mortality rates [5,7].
- Increased weight loss [7], which has been shown to increase with LOS [23].

Benefits of Effective Malnutrition Screening

Screening for malnutrition allows the early identification for those patients at risk of malnutrition [26,28,32]. It can lead to reduction in prevalence of malnutrition and improved patient outcomes [12].

Nutrition intervention however is dependent on identification of malnutrition. Once the patients are identified then they may be assessed by an APD or commence on other Medical Nutrition Therapy (MNT) which is the process of nutrition assessment, intervention and follow-up by an APD [33]. This may include the use of oral nutritional supplements or enteral feeding which have been shown to improve weight and lean muscle mass in malnourished patients [7,20-21,23-24]. Other benefits of early nutrition intervention include reduce LOS, increase calorie intake, reduced hospital costs, improved appetite and improved weight [3,9].

Reducing patient LOS can have major financial benefits for health service. Identifying malnutrition can increase hospital income by increasing financial reimbursement if malnutrition is documented as a co-morbidity or complication [16]. The cost of reducing length of stay in one study revealed that a one-day reduction in LOS was equivalent to a saving of US$91.2 [3].

Upper Hunter Cluster

Upper Hunter Cluster consists of two local Government areas, Muswellbrook and Upper Hunter. The total population of two combined areas is 29,901 [34]. See figure 1 for map of Upper Hunter Cluster. Only hospital sites were chosen in the study, which included Denman, Merriwa, Muswellbrook, Murrurundi and Scone.
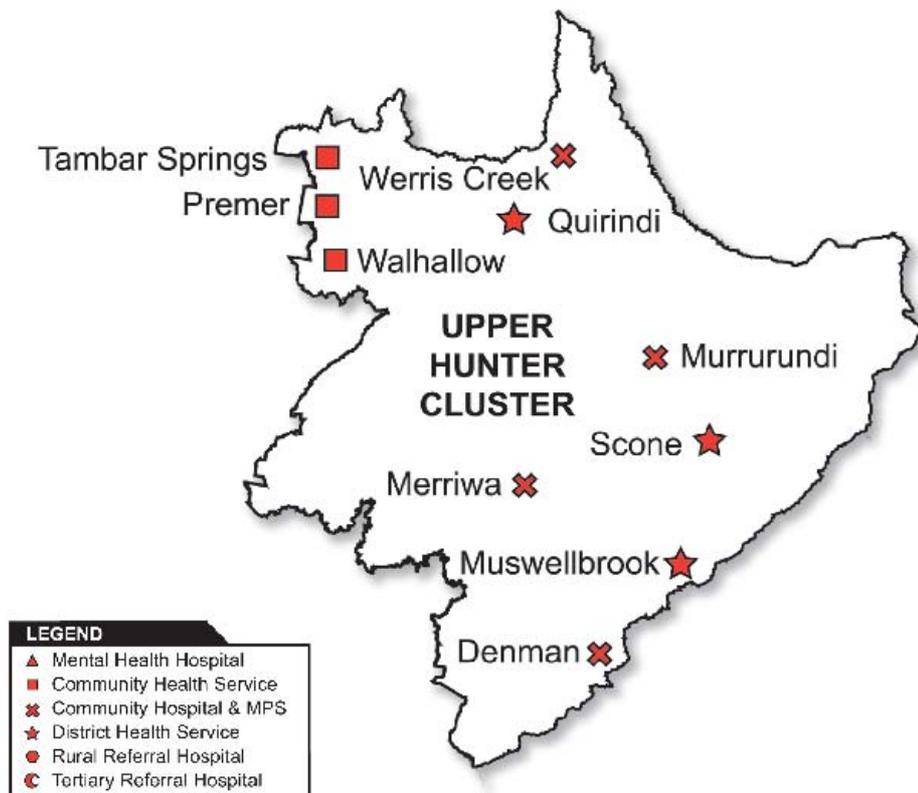
Figure 1: Map of Upper Hunter Cluster

Malnutrition Screening Tool in a Rural Area

In this rural area given that an APD may only visit the hospital once per month the patient relies on nursing staff to screen for malnutrition and refer them to an APD. This project aims to use a process of reminding the nursing staff to screen all eligible inpatients by including the MST score on patient ward list. The APD has also devised a process, which will reduce the workload for nursing staff in completing the tool. This process involves the APD contacting the ward clerk or nursing staff daily to obtain any patient names with a score of 2 or more on the MST. These patients will then receive provision of automatic nutritional supplements and dietitian assessment as part of their MNT.

As nursing staff plays a key role in the identification of malnourished patients, the APD has provided education to nursing staff on malnutrition and implementation of the MST. This has been provided at all Upper Hunter hospitals. However due to time constraints this education has not been provided on regular basis and some nurses may have missed the education session.

Research Question

Will including the Malnutrition Screening Tool (MST) score on selected Upper Hunter Hospital nursing ward lists increase MST completion rates and improve the identification of patients at risk for malnutrition?

Why is this Research Important?

The MST was implemented in all Upper Hunter hospitals in early 2007 (see appendix 3). The aim of including the MST is to ensure that all patients admitted to hospital in the Upper Hunter Cluster (excluding patients under 60 years of age, ICU, mental health patients and patients with hospital admission less than 48 hours) are screened for their risk of malnutrition, and a clinically appropriate intervention is implemented for each patient identified with increased malnutrition risk.

This research is important as the number of Upper Hunter hospital patients screened for malnutrition was noted by the APD to be low. Therefore, the numbers of patients with malnutrition receiving nutritional therapy is also low.

During the first six months of implementation of the screening tool in Upper Hunter hospitals, the MST was being used ineffectively with minimal referrals resulting from the tool across all five hospitals sites. An audit of its use on two wards showed that the tool was completed on only eight (47%) of 17 inpatients at Muswellbrook and Murrurundi Hospitals [35]. The audit also showed that there were two referrals received resulting from Malnutrition Screening Tool score [35].

With studies showing the incidence of malnutrition for elderly hospital patients in Australia being 12-55% [5-6,9,12,14,16,18-21] it would be expected that a large number of malnourished patients in Upper Hunter hospitals are not being identified with malnutrition.

In current practice in the selected study hospitals the APD sees patients with malnutrition very regularly, but who have not been previously identified through the use of a malnutrition screening tool even though they may have been hospitalised for some time already. They are often referred towards the end of hospital stay or not seen during admission at all. Being missed on the screen means their length of stay is potentially longer, their rehabilitation period lengthens, they experience more medical complications directly due to malnutrition and/or they need to have more costly care or medical procedures.

For best patient care and outcomes, it is therefore important to quickly identify and act on any patients admitted with malnutrition.

This study will determine whether the new malnutrition screening procedure of adding the MST score to the nursing ward list will improve malnutrition screening rates and nutrition support interventions for these malnourished patients.

The study will also determine the number of people who are not being identified as malnourished. This can be estimated because all patients will have the SGA performed, which assesses nutritional status [11].

Null Hypotheses
- There is no difference in completion of malnutrition screening tool by nursing staff pre and post intervention.
- There is no difference in the number of malnourished patients receiving nutritional supplements pre and post intervention.
- There is no difference in LOS for hospital patient's pre and post intervention.

Aims

The project aims to

- Determine the malnutrition screening rates in Upper Hunter hospitals both pre and post intervention.
- Identify the number of patients at risk of malnutrition in Upper Hunter hospitals.
- Determine the numbers of participants identified with malnutrition who receive MNT both pre and post intervention.
- Compare the current MST process with a new malnutrition screening process where the MST score is included on the daily nursing ward list.
- Compare LOS for patients identified with malnutrition risk and receiving nutritional supplements as part of MNT to those patients who do not receive nutritional supplements.

It is anticipated that the study will demonstrate that the new malnutrition screening procedure is able to detect more of those malnourished and establish a nutrition intervention at an earlier time point, without being dependent on the presence of the dietitian. This would potentially improve the nutrition status of these at risk patients, reduce the cost associated with their hospital care and allow the APD to focus on the most inter-actable group who may need more aggressive nutritional support.

Measuring nutritional supplements distributed to participants will highlight that with effective malnutrition screening, more participants identified at risk for malnutrition receive timely MNT.

Methods

Research Design

This is a time series design that will take a snap shot of patient populations at two distinct time points, before and after the intervention, to assess the impact in malnutrition screening on practice.

A time series design was chosen as the research design to enable enough participants to be recruited. The numbers and resources needed to recruit a randomised control study and timeframe were considered not feasible.

There are two groups of participants, a pre-intervention group and a post-intervention group to be studied. Five hospitals within Upper Hunter Cluster will be used as sites to recruit participants. These were Denman, Merriwa, Murrurundi, Muswellbrook and Scone hospitals.

In this rural area the patient relies on nursing staff to screen for malnutrition and refer them to an APD. The intervention involved educating the nursing staff of the change in practice to malnutrition screening. These changes were inclusion of the MST score on nursing ward list and APD contacting the ward clerk or nursing staff daily to obtain patient names scoring 2 or more on the MST. The changes in practice act as a process of reminding the nursing staff to screen all eligible inpatients. The patients identified with malnutrition risk then receive MNT via automatic supplements organized by the APD and follow-up APD assessment.

Recruitment

Patients were considered eligible to participate if they were over the age of 60 years (excluding mental health and ICU patients) and were willing and able to give informed consent. Those patients who had admissions to hospital less than 48 hours were not included. The study aimed to recruit 50−100 patients for each of the two groups

Identifying Potential Participants

Patients were identified for participation from viewing the hospital nursing ward list and HNEAHS Clinical Applications Port (CAP) program. This provided information on patient's age, location, diagnosis, admission date and discharge date. This data determined which patients were eligible to participate in the study.

Once potential participants were identified from the ward list, they were approached by the researcher and invited to participate in the study. This was performed face to face. Potential participants were provided with an information form (appendix 4) about the project, an HNE Information Privacy Leaflet for Patients and a consent form (appendix 5). They were notified that they could consent immediately or decide within 24 hours. Consent forms were collected within 48 hours by the researcher. This process was the same at all hospital sites involved in the study. All potential participants had the option of declining to participate. All research and information provided to participants was conducted in English.

Participants without the capacity to give consent were excluded from participating. This included patients unable to provide consent in English and participants with permanent, temporary intellectual impairment or mental impairment including dementia.

The researcher consulted with nursing and hospital staff to determine if participants had the ability to decide on participation. If the researcher was unable to determine whether a potential participant had the capacity to provide consent then the researcher had access to the Aged Care Assessment Team (ACAT) in the hospital to perform a mental assessment on the patient. Those patients assessed as not having the capacity to consent were excluded from the study.

The consent form clearly stated that personal information remained confidential to the researcher. The consent form also stated that the participant could withdraw at any time during the project. The information sheet provided to participant's stated that there would be no disadvantage for their treatment if they chose not to participate or withdraw from the study. Participants were reminded that their participation in the study would not impair any treatment or impair relationship with researcher or organisation.

Once consent was given to participate in the study, the researcher commenced assessment on the participant. This was usually performed on the same day but was not carried out until the following day on some occasions.

Aboriginal and Torres Strait Island People
The Aboriginal and Torres Strait Island status of participants was not reported in this research project. An Aboriginal Liaison Officer was consulted in the research project planning to ensure that this project would be suitable for any participants of Aboriginal or Torres Strait Island origin. The Liaison Officer agreed to assist in the recruitment, participation and consent of Aboriginal and Torres Strait Island participants and to discuss any issues that these people may have about the project.

Timeline
The data for pre-intervention and post-intervention groups was collected from participants for five weeks. There was a four-week break between the groups called the pre-intervention time period. During this time period nursing staff were educated on malnutrition and the new protocol for malnutrition screening. The research data was collected from August 25th 2008 until November 28th 2008.

Weeks 1−5: Data collection for before group (pre-intervention)
Weeks 6−9: Pre−intervention time period
Weeks 10−14: Data collection for after group (post-intervention)

Measurements
The pre-intervention and post-intervention groups had the same measurements performed at each of these time points.

The MST was performed by nursing staff and is standard clinical practice and currently performed on all hospital inpatients during their admission. The tool involves

nursing staff asking the patient if they have lost weight recently, how much weight have they lost and have they been eating poorly because of a decreased appetite.

The researcher had no input into implementation of nursing staff performing MST in the pre-intervention group but contacted nursing staff daily to determine patients identified as at risk for malnutrition in the post-intervention group.

The APD also performed and recorded MST scores for all participants to determine accuracy of MST scores by nursing staff.

Participant's nutritional status was assessed by the APD using the SGA. This is a validated method of nutritional assessment based on the features of a medical history and physical examination [5]. The SGA involves questions on weight change, dietary intake, gastrointestinal symptoms, physical impairment, and a physical examination investigating a loss of subcutaneous fat or muscle wasting [22].

All patients who consented to participate in the study received a nutritional assessment. This included patients who would not normally require APD referral.

In the post intervention time period participants received automatic nutritional supplements with malnutrition screening scores of 2 or more.

Pre−intervention Time Period

Education was provided to nursing staff during the pre intervention time period by the researcher to educate staff on changes to malnutrition screening protocol. These changes were the MST score being added to the computerized nursing ward list and the APD contacting the ward daily to obtain MST scores.

Data analysis

The researcher collected data from both groups for analysis. These data or variables consisted of:

- SGA scores for all participants
- MST completion rates
- MST score completed by nursing staff
- MST score completed by APD
- Numbers of nutritional supplements dispensed to participants from all wards
- Patients medical condition on admission as documented in CAP
- Length of hospital admission
- Age
- Gender
- Location of hospital admission
- Numbers of referrals received via the MST
- Numbers of referrals to APD received that were not from MST score
- Length of Stay (LOS)

Data on the LOS was reviewed 12-16 weeks after completion of the post-intervention group time period. This information was obtained from viewing patient data in CAP or medical records. Some patients had longer hospital admissions and this LOS data was not collected until March 2009 by the researcher. Some patient data was incomplete in CAP so staff in medical records obtained these patient files for researcher to view this data.

The data was collated in an Excel Spreadsheet for analysis. A Biostatistician from NSW Health, Nicole Mealing assisted with data analysis. The data was analysed by developing a series of contingency tables to view results. These tables were used to test established hypotheses. Hypothesis test was performed on each proportion in the pre-intervention and post-intervention groups. The null hypothesis was that there was no association between including the MST on all Upper Hunter Hospital nursing ward lists and the completion of the MST, increased referrals, increase provision of supplements and reduced LOS. A chi-squared test was performed to test whether the results were statistically significant ($p < 0.01$) for both study groups. Wilcoxin's rank sum test was used to test the mean LOS for participants at risk for malnutrition who received supplements compared to patients mean LOS who did not receive supplements. Results for equations were calculated in Excel.

Ethics
Approval for the study was obtained from the Human Research Ethics Committee in 2008 with approval number HNEHREC Reference No: 08/06/18/4.01 and NSW HREC Reference No: 08/hne/162.

Peer Review
This project received ongoing review and support from the NSW Institute of Rural Clinical Services and Teaching (IRCST) staff as part of Rural Research Capacity Building Program Grant. Peer review for this study was also provided by research mentor Clare Collins, Associate Professor in Nutrition and Dietetics, School of Health Sciences, Faculty of Health, Newcastle University. Clare provided support and mentorship on study design and interpretation.

Conflict of Interest
The principle researcher is also an employee of Hunter New England Area Health Service and the APD servicing the five participating hospitals. The research project did not impact on the dietetic management of hospital patients during the research project.

Results

Demographics

Table 1 summarises the demographic characteristics of the group by intervention status. There were 76 participants in the pre-intervention group and 66 participants in the post-intervention group. The pre-intervention group had a mean age of 79 ± 9.0 years and range of 61-94 years. The post-intervention group had a mean age of 76 ± 8.9 years and range of 60-94 years.

There were 28 participants in each group identified with malnutrition, either mild to moderate (B) or severe (C) by the SGA. The mean age for malnourished participants in the pre-intervention group was 80 ± 7.7 years and age range was 61-94 years. There were 14 females and 14 males in this group. The mean age in the post-intervention group was 76 ± 7.9 years and age range was 60-87 years. There were 11 females and 17 males in the post-intervention group.

There were three participants who had separate admissions in both the pre-intervention and post-intervention group. Their results were included as the patients previous admission had no effect on the factors measured. There were no patients who participated that had two admissions in the same study period.

The majority of participants were recruited from Muswellbrook and Scone Hospitals. There were no participants from an Aboriginal and Torres Strait Island background.

Each participant's presenting diagnosis was retrieved from CAP. Respiratory and Cardiac disorders were the two most common diagnosis with 22% and 17% presenting with respiratory disorders and cardiac disease respectively in the pre-intervention group and 24% and 17% respectively in the post-intervention group.

Demographics	Pre intervention Group n (%)	Intervention Group n (%)
Gender		
Male	47 (62%)	36 (55%)
Female	29 (38%)	30 (45%)
Age		
60-70 years	15 (20%)	18 (27%)
70-80 years	17 (22%)	22 (33%)
80+ years	44 (58%)	26 (39%)
Site		
Scone	36 (47%)	29 (44%)
Muswellbrook	30 (39%)	24 (36%)
Merriwa	5 (7%)	7 (11%)
Murrurundi	3 (4%)	6 (9%)
Denman	2 (3%)	0 (0)

Table1: Demographic distribution of surveyed participants

Prevalence of Malnutrition

The prevalence of malnutrition for patients who participated in the study was investigated. Malnutrition was determined by an SGA score of B (mild to moderate) or C (severe). Table 2 reports the prevalence of mild to severe malnutrition to be 37% of patients in pre intervention group and 42% of patients in intervention group. The total number was 39% of patients for both groups.

Table 2 highlights that there were 14% of participants for both groups combined with severe malnutrition as indicated by SGA score of C and 25% of participants combined with mild to moderate malnutrition.

The prevalence of malnutrition detected due to the increased screening rate by nurses highlighted an increase in prevalence, based on an MST score of 2 or more, from 15% to 32%.

Prevalence of Malnutrition	Before Group n (%)	After Group n (%)	Total %
SGA- A	48 (63%)	38 (58%)	86 (61%)
SGA- B	16 (21%)	20 (30%)	36 (25%)
SGA- C	12 (16%)	8 (12%)	20 (14%)
SGA- B or C	28 (37%)	28 (42%)	56 (39%)
MST >=2	11 (15%)	21 (32%)	32 (23%)

Table 2: Malnutrition prevalence for surveyed participants in Upper Hunter hospitals by intervention group

MST Completion Rates

There is a strong association between the inclusion of the MST on all Upper Hunter hospital nursing ward lists and the successful completion of the MST (χ^2=31.25, df=1, p<0.001). Figure 2 shows the change in MST completion rates between the two groups. When hospitals had the MST included on their nursing ward lists 94% completed the MST, compared with a 51% completion rate when the MST was not included on the nursing ward lists. This increase in the completion rate is estimated as 40% (95% CI, 30% to 55%).
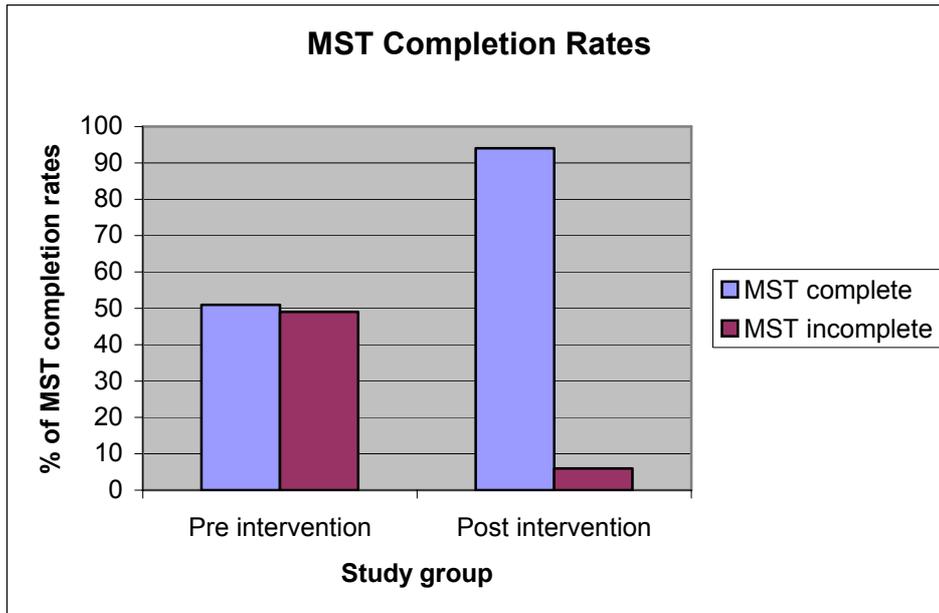
Figure 2: Comparison of MST completion rates between pre-intervention and post-intervention groups

Total Referral Rates

There is a strong association between the inclusion of the MST on all Upper Hunter hospital nursing ward lists and referrals to the APD received from the wards as a result of MST (χ^2=19.54, df=1, p<0.001). When hospitals had the MST included on their nursing ward lists 32% of patients were referred based on their MST score, compared with only 4% of referrals received from the MST when the MST was not included on the nursing ward lists (see figure 3). The increase in the referrals was 28% (95% CI, 16% to 40%).

Figure 3: Referral Rates for total numbers of participants and those for malnourished patients [a]

(a) Malnourished patients identified by SGA category B or C

Referral Rates and SGA Scores

Figure 3 demonstrates the strong association between including the MST on all Upper Hunter hospital nursing ward lists and increased referral rates to the APD for patients identified with malnutrition by SGA scores of B or C (χ^2=17.92, df=1, p <0.001). When hospitals had the MST included on their nursing ward lists 61% of malnourished patients had MST scores of 2 or more recorded by nursing staff, compared with only 7% of malnourished patients having MST score of 2 or more by nursing staff when the MST was not included on the nursing ward lists. This increase in the referral rate is estimated as 54% (95% CI, 33% to 74%).

There were some patients in both groups who were referred to the APD without MST score being stated as reason for referral. This occurred for nine patients in the pre-intervention group and five patients in the post-intervention group. Of those nine patients in the pre-intervention group, two had an MST score of 2 or more and six had incomplete MST records. The data showed that eight out of these nine patients were identified as malnourished from SGA score.

Of the five patients in the post-intervention group who were not referred due to MST score, two had MST scores of 2 or more and none were incomplete. All five were identified as malnourished from SGA score, which may mean that MST may have been performed incorrectly.

Provision of Supplement Drinks

The number of patients in the study, who received nutritional supplement drinks in both groups was recorded by the APD. Participants in the post-intervention group, who were identified at risk for malnutrition by scoring 2 or more on MST, were routinely commenced with standard supplements of Sustagen twice per day (500Kcal) unless they had a cow's milk protein allergy. Supplements were changed as per patient preference once assessed by the APD.
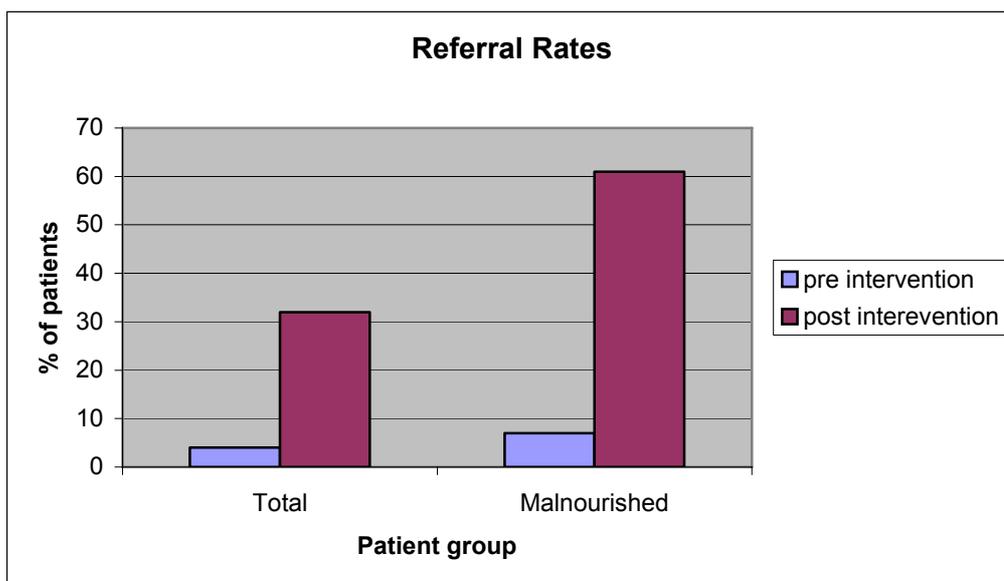
There is a strong association between including the MST on all Upper Hunter hospital nursing ward lists and the increased provision of supplement drinks to patients (χ^2=11.03, df=1, p <0.001). When hospitals had the MST included on their nursing ward lists 42% of patients received supplement drinks, compared with only 17% receiving supplement drinks when the MST was not included on the nursing ward lists (see figure 4). This increase in the provision of supplement drinks is estimated as 25% (95% CI, 11% to 40%).

There were four patients who did not receive supplement drinks in the intervention group despite the routine protocol being that they should receive the drinks due to other reasons. If they also received the supplement drinks the total number receiving drinks would have been 32 and number not receiving supplements would have been 34.
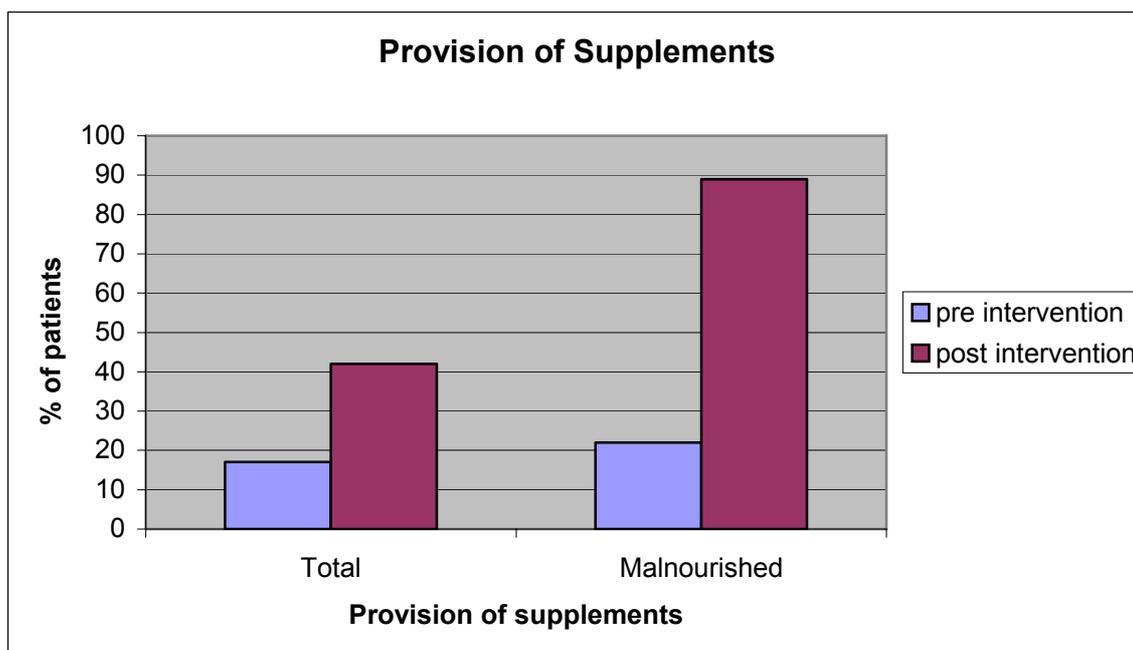
Figure 4: Provision of nutritional supplements for total numbers of participants and those for malnourished patients [a]

[a] Malnourished patients identified by SGA category B or C

Provision of Supplements and SGA Scores

The results shown in figure 4 demonstrated a strong association between including the MST on all Upper Hunter hospital nursing ward lists and the increased provision of supplements for patients with malnutrition as indicated by SGA scores B or C (χ^2=21.16, df=1, p <0.001). When hospitals had the MST included on their nursing ward lists 89% of malnourished patients received supplements, compared with only 17% of malnourished patients receiving supplements from MST when the MST was not included on the nursing ward lists. This increase in the provision of supplements for malnourished patients is estimated as 71% (95% CI, 70% to 73%).

Length of Stay (LOS)

The mean LOS for patients who received automatic supplements based on the results of their MST score in both pre-intervention and post-intervention groups was measured and analysed using Wilcoxin's rank sum test. There were two patients in both groups who became deceased during studied hospital admission and their results were removed from LOS data analysis.

There is no evidence (p=0.2) of an association between taking supplements and a malnourished person's LOS in hospital (median: 9.5 days) compared with not taking supplements (median: 7 days).

Discussion

Prevalence of Malnutrition

The prevalence of malnutrition for participants across both study periods was 39% as determined by an SGA score of B or C and was similar in both pre and post intervention periods. The results are similar to those found in both Australian and International studies on the prevalence of malnutrition in hospital. In Australian hospitals the prevalence of malnutrition as identified by SGA of B or C is approximately 30-60% [5,12,18,19].

Malnutrition Prevalence in a Rural Area

This study was conducted in five small rural hospitals. The results demonstrate that malnutrition is prevalent and a serious problem amongst the elderly patients admitted to hospital in these rural areas. A study by Edington et al (2000) showed that malnutrition prevalence was six per cent higher in tertiary hospitals compared to general hospitals[22]. The results in this Upper Hunter study indicate malnutrition prevalence is similar to those found in tertiary hospitals. Some reasons for this high prevalence rate may be attributed to the large distances required in travelling to a tertiary hospital. Patients may be too sick or refuse to travel leading to more malnourished patients being treated locally rather than being transferred.

Consequences of Malnutrition

Malnutrition affects patient outcomes and hospital costs. Patients with malnutrition have been shown to have more complications, reduced wound healing, higher mortality rates and increased LOS [2,4-5,7,21-22]. This study did not measure these patient outcomes, which may have shown improvements for those patients provided with earlier MNT. Patients with increased LOS are also more likely to malnourished [23,36] and incur increasing costs [1,3].

Malnutrition Screening Tool Completion Rates

The identification of malnourished patients can help to reduce hospital costs and improve patient outcomes with potential lower cost admissions and less patient complications. Poor documentation of malnutrition is a major factor in the poor recognition of malnutrition. Australian and overseas studies have found poor documentation of malnutrition diagnosis by medical staff[16,18-19,23]. Lazarus and Hamlyn (2005) suggest reasons for this may include difficulty interpreting malnutrition definitions in the International Statistical Classification of Diseases and Related Health Problems (ICD)[18]. This can lead to lower financial reimbursement for hospitals. By raising awareness of malnutrition through efficient screening and documentation there are financial benefits to be gained.

Recognition of malnutrition was observed to be poor by APD in the Upper Hunter hospitals (Seldon, Unpublished observations, 2007). This was confirmed with MST audits [35] performed in Upper Hunter hospital wards. Features of this poor recognition included poor referral rates for malnourished patients, poor MST completion rates by nursing staff and poor identification of malnourished patients.

Other studies have also highlighted the poor recognition of malnutrition in hospitals [5,18,23,27]. With MST screening often being performed by nursing staff, reasons for poor

recognition include poor awareness of malnutrition risk factors and its effect on clinical outcomes by staff [19]. Adams et al (2008) found that poor referral rates for malnutrition may be caused by staff not considering malnutrition screening part of their role [19].

This study was able to demonstrate that the change in screening practice instigated by the APD was able to improve the completion rates of the MST by nursing staff in Upper Hunter hospitals. The increase was 43% for the intervention group with the completion rate increased to 94%.

The change in screening practice was effective in demonstrating a successful team approach to improving a rural issue of poor identification of malnourished patients in hospital. With nursing staff completing more screening this enabled the APD to identify at risk patients and provide them with timely MNT. With the APD contacting the ward daily to obtain MST scores this reduced nursing staff workload as the APD initiated these referrals.

Although the nurses were not surveyed about reasons for improvements in completions rates the main observed reason for the increase in completion rate of the MST was that the new malnutrition screening process was implemented as a routine requirement of nurses. Some other reasons that may have contributed to the improved completion rate include greater awareness of malnutrition screening through education of staff by the APD, repeated exposure to MST score on ward list, greater accountability from nurse unit manager or ward clerk who reminded staff to complete and add score to list, and more frequent contact from the APD via daily phone calls for MST scores. If regular education is not provided for nursing and support staff on malnutrition awareness and the MST then the improvements may be lost.

As a result of increasing screening rates for the MST by nurses there was an increase in the number of patients identified at risk for malnutrition. These patients received automatic nutritional supplements while waiting for a full nutritional assessment and tailoring of their MNT secondary to the automatic referral to the APD.

Screening for Malnutrition Risk

In the post-intervention group 32% of participants were identified as at risk for malnutrition compared with only 15% of participants in the pre-intervention group. With results showing that 39% of total participants had malnutrition as identified by SGA score the change in practice resulted in the majority of patients with malnutrition being identified. Results from the pre-intervention group showed a big gap between numbers of patients identified at risk for malnutrition via MST and numbers of participants identified with malnutrition by SGA. The results also demonstrate that the MST is an effective tool for identification of malnourished patients [2].

Referral Rates

By increasing MST screening rates the referrals to the APD for patients at risk for malnutrition increased. This increase was by 28% with referral rates for patients at risk for malnutrition increasing from 4% in the pre-intervention group to 32 % (this is actually an 8 fold increase) in the post-intervention group. This is significant as 61% of patients with malnutrition from SGA score were identified in the post-intervention group compared with only 7% in the pre-intervention group. With Australian studies

indicating that 30-60% of patients are malnourished or at risk of malnutrition [5,12,18-19] the change of practice in screening resulted in malnourished patients actually being identified and receiving MNT.

Nutritional Supplements for Malnourished Patients

Medical nutritional therapy provided for patients identified at risk for malnutrition by MST score consisted of two steps. The first step in this process was commencement of automatic supplementation for patients who received two Sustagen drinks (2100kJ) daily. The patient's nutritional status was then assessed by the APD. This occurred on the same day for some patients but could have been up to one week for others depending on location of patients and availability of an APD. Patients who did not tolerate prescribed supplements were offered alternate nutritional supplements such as fruit based high energy/protein drinks.

There was a significant increase in provision of supplement drinks to patients when the MST score was added to the ward list. This increase was estimated as 25% and the numbers of patients receiving automatic supplements was similar to the prevalence of malnutrition in the post-intervention group. This indicates that a greater proportion of those patients with malnutrition risk received timely nutrition support. The results were even more significant in malnourished patients in the study in which there was a 71% increase in supplement provision. This is important for addressing the malnutrition at an individual level.

Providing nutritional support to malnourished patients has been shown to lead to improved clinical outcomes such as reduction in complications, improved wound healing, decreased infections and improvements in weight, anthropometry and energy intake [7-9,37-38]. However, this is dependent on the patient consuming the nutritional supplements. Some studies have suggested that nutritional supplements provided as part of medication program have higher compliance rates [9,38].

Some patients in the study who were eligible to receive automatic supplements due to malnutrition risk did not receive supplement drinks due to being discharged before supplements could be provided or refusal of supplements. Some patients were already receiving supplements when seen by the APD. This may be due to the patient or doctor requesting supplements or the patients receiving same diet as their recent admission, which may have included supplements.

One limitation to this new procedure of providing automatic supplements for patients identified at risk for malnutrition is the limited capacity of the APD to order supplements due to only one APD servicing Upper Hunter hospitals. Delays with MNT are caused due to the APD often being unavailable to contact hospitals. A new procedure for automatic supplementation for at risk patients needs to be developed which will be supervised by the APD but will not depend on the APD arranging supplements for each malnourished patient. This will ensure patients receive timely nutrition intervention.

Length of Stay

The results from this study showed that there was no difference in mean LOS for patients identified at risk for malnutrition and receiving supplements compared to those participants not receiving supplements. The median LOS was found to be smaller in the group that did not take supplements.

Many factors would contribute and influence length of stay such as type and severity of primary diagnosis so it is difficult with this data to assess a specific association between taking supplements and LOS in malnourished persons since we cannot adjust for these factors. A more extensive study would need to be conducted to explore an association between supplements and a malnourished person's LOS. A larger sample size may also demonstrate reduced LOS for patients identified with malnutrition and who then received timely MNT [5,21].

Implications for Practice

The change in practice for screening malnutrition risk of hospital patients has been successful in improving the identification of malnutrition and provision of timely MNT in this rural area. Despite limited staffing the APD has worked with nursing and hospital staff as a team in a rural design setting to make better use of very limited resources for the benefit of the patient.

With regular communication by the APD in contacting wards daily to obtain the MST scores and the education and support for nursing and hospital staff with malnutrition screening has seen patient access MNT earlier.

Current dietitian staffing levels will not manage the increased demands from referrals that the MST may flag as during the intervention period dietitian referrals for malnutrition increased eight fold. The system for identifying and providing MNT for malnourished patients could be better potentially if the hospital had some nutrition assistants and perhaps a budget to allow the APD to regularly educate and support nursing staff with malnutrition screening. Without this ongoing education and support for nursing staff the success of the intervention is compromised.

A nutrition assistant could assist the dietitian with malnutrition screening, ordering of nutritional supplements, provision of special diets and provision of basic dietary education for these patients. The potential of using nutrition assistants in the hospital may provide great benefit to the dietitian department and hospital service.

Limitations

By excluding patients unable to consent to participate in the study this may have reduced the number of patients identified with malnutrition as many of these patients were too sick to consent and were experiencing poor appetite and weight loss.

Due to limited staffing and resources, the researcher was the only person available to recruit participants. Ideally support staff or nursing staff could have bee0 ROn involved with recruiting participants but there was no additional staffing available to perform this task for the study.

The small sample size studied may have contributed to LOS results whereby there was no association found that LOS was reduced for patients receiving nutritional supplements during hospital admission.

Patient outcome measures such as complication rates were not measured due to the limited time and resources available in this study. These results may have further demonstrated the effectiveness of improvements in malnutrition screening rates.

Due to the time series nature of the study it was not possible to cost the identification of malnutrition and potential reimbursement for the hospitals.

Bias

The presence of the researcher who was the hospital APD on ward may have influenced nursing staff compliance with MST screening with the APD presence acting as a reminder to screen patients. However, in the real world this is also what would happen and so the presence of the APD may infact be the important part of the intervention itself and just as central to the improvement as having a better system in place.

Strengths

The APD presence on the ward may mean sustainability of the intervention was better than it would otherwise have been. The intervention was performed in a "real" rural location and shown to make a big difference with improvements in malnutrition screening rates by nursing staff and an increase in the number of patients identified at risk for malnutrition who received timely MNT.

Conclusion

This study has highlighted the high prevalence of malnutrition for elderly patients in Upper Hunter hospitals. This prevalence in a rural area was shown to be similar to malnutrition prevalence rates found in tertiary hospitals.

The study showed that the change in practice instigated by the APD in malnutrition screening with education provided to staff on how to perform the MST, placing MST on ward list and daily contact with APD increased completion rates of the MST by nursing staff. As a result more patients were identified with malnutrition and these patients were provided with nutritional supplements as part of MNT early in their stay and referred appropriately to the APD for follow up care.

The problem of unrecognised malnutrition remains high in Australian hospitals. In hospitals without APD or nutrition assistants to perform malnutrition screening ongoing education and interaction needs to be provided to nurses and support staff involved with this task to increase completion rates for malnutrition screening and raise awareness of malnutrition.

The challenge to ensuring malnourished patients continue to be identified and provided with timely MNT lies with improving the procedure for MNT for these patients.

Recommendations

The success of the studied change in practice of malnutrition screening suggests the change should be added to the protocol for future use.

Without a budget to support the APD to provide ongoing education to hospital staff on malnutrition and manage the increase in APD referrals from the MST, the service needs to include an increased role from support staff such as nutrition assistants or nursing staff with malnutrition screening and these screening tasks managed by the APD. If more support was provided this would ensure timely MNT was provided to malnourished patients and would also free up the APD's time to allow a focus on the most intractable nutrition issues and allow the APD to support nursing staff in dealing with a nutritionally vulnerable population, in the context of a rural setting. In addition, if the revised approach is successful it will be sustainable and will address what is common, the rural issue of understaffing or vacant allied health positions.

To continue the effectives of malnutrition screening in Upper Hunter and overcome the challenges posed by rural issues of low APD staffing, inability to cope with increased referrals for malnourished patients and lack of nutrition assistant position a number of strategies and research needs to be investigated. These include:

- Surveying nursing and support staff involved with screening to determine their satisfaction with MST change.
- Researching malnutrition awareness amongst hospital staff. This may highlight reasons for poor malnutrition identification and documentation by hospital staff.
- Investigating different levels of automatic supplements for patients at risk of malnutrition. Patients with higher MST scores may benefit from increased

provision of supplements and inclusion of supplements as part of medication round.

- Researching LOS data for malnourished patients. This could include analysing participant's medical diagnosis and identifying those patients who had longer LOS for whom nutrition status had no effect such as patients waiting for nursing home bed.
- Researching the role and benefits of using a Nutrition Assistant or Diet Aide in malnutrition screening and treatment.
- Studying the effect on patient outcomes such as complications and weight change for those receiving MNT as a result of MST score.

Reference List

[1] Amaral T, Matos L, Tavares M, Subtil A, Martins R, Nazare M and Pereira N. The economic impact of disease-related malnutrition at hospital admission. Clin Nutr 2007; 26: 778-784.

[2] Ferguson M, Capra S, Bauer J, Banks M. Development of a valid and reliable malnutrition screening tool for adult acute hospital patients. Nutrition 1999; 15: 458−464.

[3] Kruizenga H, Van Tulder MW, Seidell JC, Thijs A, Ader J, Van Bokhorst-de van der Schueren M. Effectiveness and cost-effectiveness of early screening and treatment of malnourished patients. Am J Clin Nutr 2005; 82: 1082-1089.

[4] Kubrak C, Jensen L. Malnutrition in acute care patients: A narrative review. Int J Nursing Studies 2007; 44: 1036-1054.

[5] Middleton MH, Nazarenko G, Nivison−Smith I, Smerdely P. Prevalence of malnutrition and 12−month incidence of mortality in two Sydney teaching hospitals. Intern Med J 2001; 31: 455−461.

[6] Thomas JM, Isering E, Kellett E. Nutritional status and length of stay in patients admitted to an Acute Assessment Unit. J Hum Nutr Diet, 2007; 20: 320-328.

[7] Vanderkroft D, Collins, C, Fitzgerald M, Lewis S, Neve M and Capra S. Minimising undernutrition in the older inpatient. International J Evidence Based Healthcare 2007; 5: 110−181.

[8] Milne A, Potter J, Vivanti A, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. Cochrane Database of Systematic Reviews 2009, Issue 2. Art. No.: CD003288. DOI: 10.1002/14651858.CD003288.pub3.

[9] Jukkola K, MacLennan P. Improving the efficacy of nutritional supplementation in the hospitalized elderly. Australasian J on Ageing 2005; 24: 119-124.

[10] Leggo M, Banks M, Isenring E, Stewart L, Tweeddale M. A quality improvement nutrition screening and intervention program available to Home and Community Care eligible clients. Nutr Diet 2008; 65: 162-167.

[11] Detsky AS, McLaughlin JR, Baker JP, Johnston N, Whittaker S, Mendeldon RA, et al. What is subjective global assessment of nutritional status? J Parenter Enteral Nutr 1987; 11: 8-13.

[12] Banks M, Ash S, Baur J, Gaskill D. Prevalence of malnutrition in adults in Queensland public hospitals and residential aged care facilities. Nutr Diet 2007; 64: 172−178.

[13] Bauer J, Capra S. Comparison of a malnutrition screening tool with subjective global assessment in hospitalised patients with cancer-sensitivity and specificity. Asia Pacific J Clin Nutr 2003; 12: 257−260.

[14] Beck, E, Patch C, Milosavljevic M, Mason S, White C, Carrie M, Lambert K. Implementation of malnutrition screening and assessment by dietitians: malnutrition exists in acute and rehabilitation settings. Aust J Nutr Diet 2001; 58: 92−97.

[15] Ferguson ML, Bauer J, Gallagher B, Capra S, Christie DRH, Mason BR. Validation of a malnutrition screening tool for patients receiving radiotherapy. Australasian Radiology 1999; 43: 325−327.

[16] Ferguson M, Capra S, Bauer J, Banks M. Coding for malnutrition enhances reimbursement under casemix-based funding. Aust J Nutr Diet 1997; 54: 102-108.

[17] Isenring E, Cross G, Daniels L, Kellett E, Koczwara B. Validity of the malnutrition screening tool as an effective predictor of nutritional risk in oncology outpatients receiving chemotherapy. Support Care Cancer 2006; 14: 1152−1156.

[18] Lazarus C, Hamlyn J. Prevalence and documentation of malnutrition in hospitals: A case study in a large private hospital setting. Nutr and Diet 2005; 62: 41−47.

[19] Adams N. E, Bowie A. J, Simmance N, Murray M, Crowe T. C. Recognition by medical and nursing professionals of malnutrition and risk of malnutrition in elderly hospitalised patients. Nutr Diet 2008; 65: 144-150.

[20] Marshman R, Fisher MM, Coupland GAE. Nutritional status and postoperative complications in an Australian Hospital. Aust NZ J Surg 1980; 50: 516−519.

[21] Wood B, Kelleher D, Lo L, Burns E, Cleary J, Thien C, Bontoft J. Nutritional status in hospital inpatients: implications for nutritional support services. Aust NZ J Med 1985; 15: 435−41.

[22] Edington J, Boorman J, Durrant ER, Perkins A, Giffin CV, James R, et al. Prevalence of malnutrition on admission to four hospitals in England. Clin Nutr 2000; 19: 191-195.

[23] McWhirter JP, Pennington CR. Incidence and recognition of malnutrition in hospital. BMJ 1994; 308: 945−948.

[24] O'Flynn J, Peake H, Hickson M, Foster D, Frost G. The prevalence of malnutrition in hospitals can be reduced: results from three consecutive cross−sectional studies. Clin Nutr 2005; 24: 1078−88.

[25] Stratton RJ, King CL, Stroud MA, Jackson AA, Elia M. 'Malnutrition Universal Screening Tool' predicts mortality and length of hospital stay in acutely ill elderly. Br J Nutr 2006; 95: 325-30.

[26] Thorsdottir I, Jonsson PV, Asgeirsdottir AE, Hjaltadottir I, Bjornsson S, Ramel A. Fast and simple screening for nutritional status in hospitalised, elderly people. 2005 J Hum Nutr Diet; 18: 53-60.

[27] Visvanathan R, Macintosh C, Callary M, Penhall R, Horowitz M, Chapman I. The nutritional status of 250 older Australian recipients of domiciliary care services and its association with outcomes at 12 months. J AM Geriatr Soc 2003; 51: 1007-1011.

[28] Ferguson M, Capra S. Nutrition screening practices in Australian hospitals. Aust J Nutr Diet 1998; 55: 157-161.

[29] Todorovic V. Detecting and managing undernutrition of older people in the community. British Journal of Community Nursing 2001; 6: 54-60.

[30] Brugler L, Stankovic A, Schlefer M, Bernstein L. A simplified nutrition screen for hospitalised patients using readily available laboratory and patient information. Nutrition 2005; 21: 650-658.

[31] Kowanko I, Simon S, Wood J. Nutritional care of the patient: nurses' knowledge and attitudes in an acute care setting. J of Clin Nurs 1999; 8: 217-224.

[32] Brugler L, DiPrinzio MJ, Bernstein L. The five year evolution of a malnutrition treatment program in a community hospital. J Quality Improvement 1999; 25: 191-206.

[33] The DAA NSW Diabetes Practice Guideline Committee. Evidence Based Practice Guidelines for the Nutritional Management of Type 2 Diabetes Mellitus for Adult. Place published: Dietititans Association of Australia 2006.

[34] Australian Burea of Statistics. Regional Population Growth, Australia, 2007-08, viewed 11th February 2009,
http://www.abs.gov.au/ausstats/abs@.nsf/Products/3218.0~2007-08~Main+Features~New+South+Wales?OpenDocument

[35] Unpublished report, Audit of Malnutrition Screening Tool use in Upper Hunter Hospital Wards 2007.

[36] Kondrup, J. Allison, SP, Elia M, Vellas B, Plauth M. ESPEN Guidelines for Nutrition Screening. Clin Nutr 2003; 22: 415-421.

[37] Potter J, Langhorne P, Roberts M. Routine protein energy supplementation in adults: systematic review. BMJ 1998; 317:495-501.

[38] Roberts, M, Potter J, McColl J, Reilly J. Can prescription of sip-feed supplements increase energy intake in hospitalised older people with medical problems. Br J Nutr 2003; 90: 425-429.

Appendices

Appendix 1   Upper Hunter Cluster Nutrition Screening Protocol

Appendix 2   Malnutrition Screening Tool

Appendix 3   Subjective Global Assessment

Appendix 4   Information Statement for Research Project

Appendix 5   Consent form for Research Project

Appendix 1

UPPER HUNTER CLUSTER		Procedure No :
MANUAL		
Nutrition and Dietetics		**Page 35 of 43**
Nutrition Screening Tool		
Procedure Issued Procedure Reviewed Procedure to be Reviewed	May 2007 Date Date	

Outcome
To ensure that all patients admitted to Hospital In Upper Hunter Cluster (excluding paediatrics and ICU) are screened for their risk of malnutrition, and acted on appropriately.

Background:
Malnutrition is well recognised to be associated with increased length of stay, increased complications, increased hospital costs and increased mortality. By identifying malnutrition early, appropriate and timely nutrition intervention can be implemented which may assist in improving clinical outcomes (Middleton M et al 2001).

Nutrition screening is the process of identifying patients with characteristics commonly associated with nutrition problems who may require comprehensive nutrition assessment (ADA, 1994). The Malnutrition Screening Tool (MST) is a validated nutritional screening tool which is simple and quick to apply (Ferguson M et al, 1999).

Protocol
- Screening is conducted by Nursing staff within 48 hours of patients admission to ward, and once per week after initial screening.

- Patients who are NBM, on enteral feeds or TPN do not require screening. Once these patients commence an oral diet, they are to be screened.

- All patients with an MST score of 2 or more are to be assessed by the dietitian.

- The dietitian must document in the medical notes once the patient is assessed.

- If a dietitian is unable to assess patients with a MST of 2 or more due to work commitments or leave, the dietitian will follow up the patient in hospital as soon as possible or contact at home if discharged.

Reference

ADA. Identifying patients at risk: ADA's definitions for nutrition screening and nutrition assessment. Journal of the American Dietetic Association 1994: 94:838-839.

Ferguson M, Bauer J, Banks M, Capra S. Development of a valid and reliable malnutrition screening tool for adult acute hospital patients. Nutrition 1999; 15: 458-464.

Middleton M, Nazarenko G, Nivision-Smith I, Smerdely P. Prevalence of malnutrition and 12 month incidence of mortality in two Sydney teaching hospitals. Internal Medicine Journal 2001; 31:455-461.

Nutrition Screening, RPA Hospital, 2005

This procedure was ratified on _____, by:

- _____ *Committee*   Chairperson: _____

Appendix 2

Malnutrition Screening Tool (MST)

Please circle appropriate answer to each question.

Have you lost weight recently without trying ?
 	
        If No
 	
        If unsure
	
	0
	
	2

If Yes, how much weight have you lost?
 	
        1 – 5 kg (2-11 lb)
 	
        6-10 kg (1-1 ½ st)
 	
        11-15 kg (1 ¾ - 2 1/3 st)
 	
        > 15 kg (> 2 1/3 st)
 	
        Unsure
	
	1
	
	2
	
	3
	
	4
	
	2

Have you been eating poorly because of a decreased appetite?
 	
        If No
 	
        If yes
	
	0
	
	1

Total If the score is 2 or more please refer to the dietitian	
Date Dietitian contacted	
Date seen by Dietitian	

(Ref: Ferguson M et al, Nutrition 15:458-464, 1999)

Appendix 3

Subjective Global Assessment

Name:

Date:

Medical History	A	B	C
WEIGHT Usual weight…………. Current weight….…....			
Wt change past 6 months Amount weight loss…….... % weight loss………….			
0-<5% loss	*		
5-10% loss		*	
>10% loss			*
Weight change past 2 weeks Amount………………			
No change; normal weight	*		
Increase to within 5%	*		
Increase (1 level above)	*	*	
No change, but below usual wt		*	
Increase to within 5-10%		*	
Decrease			*
DIETARY INTAKE			
No change; adequate	*		
No change; inadequate		*	
Change **Duration of change**…………..			
Suboptimal diet		*	
Full liquid		*	
Hypocaloric liquid			*
Starvation			*
Intake borderline; increasing	*		
Intake borderline; decreasing		*	
Intake poor; no change		*	*
Intake poor; increasing		*	
Intake poor; decreasing			*
GASTROINTESTINAL SYMPTOMS			
Frequency (never, daily, no. of times/week) Duration (<2wk, >2wk)			
Nausea …………………… ………………..			
Vomiting …………………… ……………….			
Diarrhoea …………………… ………………...			
Anorexia …………………… ………………...			
None; intermittent	*		
Some (daily >2 week)		*	
All (daily >2 week)			*
FUNCTIONAL CAPACITY			
No dysfunction Duration of change …………….	*		
Difficulty with ambulation/normal activities		*	
Bed/chair-ridden			*
Change past 2 week			
Improved	*		
No change		*	
Regressed			*

Physical examination	A	B	C
SUBCUTANEOUS FAT			
Under the eyes	Slightly bulging area		Hollowed look, depression, dark circles
Triceps	Large space between fingers		Very little space between fingers, or fingers touch
Biceps	Large space between fingers		Very little space between fingers, or fingers touch
MUSCLE WASTING			
Temple	Well-defined muscle/flat	Slight depression	Hollowing, depression
Clavicle	Not visible in Males; may be visible but not prominent in females	Some protrusion; may not be all the way along	Protruding/prominent bone
Shoulder	Rounded	No square look; acromion process may protrude slightly	Square look; bones prominent
Scapula/ribs	Bones not prominent; no significant depressions	Mild depressions or bone may show slightly; not all areas	Bones prominent; significant depressions
Quadriceps	Well rounded; no depressions	Mild depression	Depression; thin
Calf	Well developed		Thin; no muscle definition
Knee	Bones not prominent		Bones prominent
Interosseous muscle between thumb and forefinger	Muscle protrudes; could be flat in females		Flat or depressed area
OEDEMA (related to malnutrition)	No sign	Mild to moderate	Severe
ASCITES (related to malnutrition)	No sign	Mild to moderate	Severe
OVERALL SGA RATING	**A**	**B**	**C**

Adapted from: Detsky et al., 1994[8]; Baxter Healthcare Corporation, 1993; McCann, 1996
(Ferguson, Bauer, Banks, Capra, 1996)©

Appendix 4

HUNTER NEW ENGLAND
NSW⊕HEALTH

Shaun Seldon
Hunter New England Area Health Service
Upper Hunter Community Health Service
Muswellbrook, NSW 2333
Phone: 65422712
Fax:65422005
Shaun.seldon@hnehealth.nsw.gov.au

Information Statement for the Research Project: **Improving the identification of malnutrition for hospital patients**
Version 2 dated 17/07/08

You are invited to take part in the research project identified above which is being conducted by Shaun Seldon from Hunter New England Area Health Service. Patients from Denman, Merriwa, Murrurundi, Muswellbook and Scone Hospitals will be invited to participate in this study if it is suitable for them.

Purpose of the Project:
The purpose of this study is to trial a new method of identifying patients with malnutrition, and to compare this to the current method. Malnutrition is caused from a diet inadequate in protein or energy. Weight loss, reduced appetite and tiredness can result from malnutrition and it is associated with longer hospital stay and reduced wound healing. Previous research has shown that 30-50% of all elderly hospital patients have malnutrition or are at risk for malnutrition on admission to hospital.

Participation:
We are seeking people aged 60 years and over who have been admitted to hospital for greater than 48 hours to participate in this research.

What choice do you have?
Participation in this research is entirely your choice. Only those people who give their informed consent will be included in the project. Whether or not you decide to participate, your decision will be included in the project. Whether or not you decide to participate your decision will not disadvantage you in anyway and will not affect your hospital treatment or nutritional care.

If you do decide to participate, you may withdraw from the project at any time without giving a reason. There will be no disadvantage for your treatment by withdrawing from the project.

The researcher may withdraw a participant if it is considered in the participant's best interest or it is appropriate to do so for another reason. If this happens, the researcher will explain why and advise you about any follow-up procedures or alternative arrangements as appropriate.

What would you be asked to do?
If you agree to participate, you will be asked to:
- Provide information to nursing staff about changes in appetite and weight loss as part of the Malnutrition Screening Tool.
- Provide information to the researcher about your dietary intake and medical history, .
- You will also be asked to consent to the researcher performing a nutritional assessment. This assessment includes obtaining a medical history and taking measurements of body fat as part of physical examination.
- Consent to provision of Sustagen supplement drink if you are rated at risk for malnutrition by the malnutrition screening tool.

How long will the study take?
Completion of the Malnutrition Screening Tool by nursing staff will take approximately 5 minutes. This assessment will take place at your bedside soon after you have been in hospital for 48 hours.

Completion of the Nutrition assessment by the researcher will take approximately 30 minutes. This assessment will take place at your bedside in hospital during your hospital stay.

What are the risks and benefits of participating?

Benefits:
Participants identified with malnutrition during this project will receive the benefit of timely nutrition intervention.

Risks:
For participants identified at risk for malnutrition and who have cow's milk protein allergy, consuming supplement drinks in the research project could initiate an allergic reaction.

How will your privacy be protected?
Individuals will not be identified. The location of your admission during hospital will be noted.

How will the information collected be used?
The data obtained from the research will be used to document a report and sent to the NSW Institute of Rural Clinical Services and Teaching. The report may be presented at relevant professional conferences and workshops. The report may be submitted for publication in a suitable medical journal.

The information collected will be used to review and make changes to the management of malnutrition for hospital patients in the Upper Hunter.

Individual participants will not be identified in any reports arising from the project.

Participants can select to receive a project summary in the consent form.

What do you need to do to participate?
Please read this Information Statement and be sure you understand its contents before you consent to participate. If there is anything you do not understand, or you have questions, contact the researcher.

If you would like to participate, please complete the attached Consent Form. This will be taken as your informed consent to participate. You will have 24 hours to consent. The researcher will arrange to pick up the consent from.

Further information

For further information, please contact:

Shaun Seldon
Senior Dietitian
Upper Hunter Cluster
HNEAHS
PO Box 120, Muswellbrook NSW 2333
Ph (02) 65422712   Fax (02) 65422005
Email: Shaun.Seldon@hnehealth.nsw.gov.au

Thank you for considering this invitation.

Signatures

Shaun Seldon   Signature_____

Complaints about this research

This research has been approved by the Hunter New England Human Research Ethics Committee of Hunter New England Health, Reference No 08/06/18/4.01.

Should you have concerns about your rights as a participant in this research, or you have a complaint about the manner in which the research is conducted, it may be given to the researcher, or, if an independent person is preferred, to
Dr Nicole Gerrand,
Professional Officer (Research Governance and Ethics),
Hunter New England Human Research Ethics Committee,
Hunter New England Health, Locked Bag 1, New Lambton NSW 2305,
Phone (02) 49214950,
Email: Nicole.Gerrand@hnehealth.nsw.gov.au

Appendix 5

HUNTER NEW ENGLAND
NSW⊕HEALTH

Shaun Seldon
Hunter New England Area Health Service
Upper Hunter Community Health Service
Muswellbrook, NSW 2333
Phone: 65422712
Fax:65422005
Shaun.seldon@hnehealth.nsw.gov.au

Ethics No:

Consent Form for the Research Project: **Improving the identification of malnutrition for hospital patients**
Version 1 dated 30/06/2008

Researchers:
- Shaun Seldon – Senior Dietitian, Upper Hunter Cluster

Consent Statement

I agree to participate in the above research project and give my consent freely.

I understand that the project will be conducted as described in the Information Statement, a copy of which I have retained.

I understand I can withdraw from the project at any time and do not have to give any reason for withdrawing.

I consent to:
- Non identified data being recorded by the researcher
- Allowing nursing staff to complete routine malnutrition assessment during my inpatient admission
- Allowing researcher to complete nutrition assessment
- Allowing researcher to supplement my meals with a Sustagen or alternative supplement drink if I am rated at risk for malnutrition by Malnutrition Screening Tool (MST).

I understand that my personal information will remain confidential to the researchers.
I have the opportunity to have questions answered to my satisfaction.

I wish to receive a project summary   ☐

Print Name:

Signature: **Date:**

I have informed the above person about this research and am sure that they understand both the content of the information statement and the additional information I have provided.