An evidence-based nutritional support guideline for geriatric hip fracture patients to promote post-operative rehabilitation

Wong Yee Shan

School of Nursing

Li Ka Shing Faculty of Medicine

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Wong Yee Shan

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Abstract

Nutritional status is usually being neglected for the care of the elderly patients and so does the elderly hip fractured patients in orthopaedics settings. Malnutrition can lead to severe fatal consequences especially to elderly. Evidences showed that rehabilitation outcomes could be promoted if nutritional status is maintained peri-operatively for hip fractured patients requiring surgeries. However, there is not standardized guideline when handling geriatric hip fracture patients’ nutritional requirement in local settings.
This dissertation is a translational nursing research aims at developing an evidence-based guideline on nutritional support for geriatric hip fracture patients requiring orthopaedic surgeries. Six relevant high quality studies are identified and critically appraised by using the methodology checklist designed by Scottish Intercollegiate Guidelines Network (SIGN). After summarizing and synthesizing the data, the intervention is found to be effective to the clinical issue on increasing patients’ serum albumin levels and minimizing post-operative complications.

The implementation potential of the proposed intervention is assessed in terms of transferability, feasibility and cost-effectiveness. Recommendations for the intervention are made on the basis of patient screening, intervention and evaluation. In order to have a smooth and effective implementation, a comprehensive communication plan with different stakeholders is developed. Pilot study and evaluation plans are also established. This nutritional support programme is expected to promote the serum albumin levels and reduce complication rates for the geriatric hip fracture patients having hip surgeries ultimately to promote patients’ rehabilitation outcomes.
Declaration

I declare that this dissertation represents my own work, except where due acknowledgement is made, and that it has been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualification.

Signed ........................................

Wong Yee Shan
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Chapter 1: Introduction

Malnutrition is a worldwide problem affecting the aged population. Although it is a chronic disease, it may also have severe consequences if not managed in an early stage. Malnutrition can cause muscle loss, immune dysfunction, higher morbidity, mortality and complication rate. Malnutrition of elderly are usually not being recognized and treated since it is always being put in a lower priority in the treatment.

In orthopaedics and traumatology (O&T), patients may need extra muscle strengths for their physical recovery after the orthopaedics surgeries. Geriatric hip fracture is the most common admission cause in an acute O&T setting. In general, it takes more than three weeks of hospitalization for surgery and rehabilitation before discharge. A majority of the hip fractured patients cannot return home after discharge due to increased dependency of their daily living. This greatly affects patients’ quality of life. Therefore, there is an urge to develop a systematic guideline for nutritional support for the geriatric hip fracture patients in promoting their post-operative outcomes.

In this chapter, the background information of the clinical issue will be discussed in detail. Affirming needs for an evidence-based guideline, the objectives and significance of the project will also be provided.
1.1 Background

1.1.1 Malnutrition and Protein-energy Malnutrition

Malnutrition refers to the imbalanced nutritional status that can be divided into under-nutrition and over-nutrition. Under-nutrition can be the result of complications of illness leading to poor absorption or excessive nutrient loss, and insufficient dietary intake. Protein-energy malnutrition (PEM) or protein-calorie malnutrition is one of the most common malnutrition statuses around the world. It refers to the nutritional deficiency resulted from either inadequate energy (caloric) or protein intake. Muscle wasting, loss of muscle mass and function are serious consequences of PEM (WHO, 2000).

1.1.2 Prevalence and consequences to elderly

In general, the prevalence of hospitalized malnutrition in acute setting is from 20 to 50% (Banks et al., 2007; Bauer et al., 2012; Pirlich et al., 2006; Russell & Elia, 2008). With the advance in age, the risk of malnutrition is higher due to the presence of chronic diseases, and the physiological and psychosocial changes. The rates for the aged reported were even as high as 80% (Holyday et al., 2012). Although PEM seems to be a common problem affecting infants and children in developing countries (Bern et al., 1997), it also
affects the elderly in developed countries. Agarwal et al. (2013) reviewed that the prevalence for PEM in older adults was 22-60%.

Malnutrition affects the cellular activities leading to immune dysfunction which may cause infection and higher complication rates, poor wound healing, prolonged hospital stay, increased muscle loss and ultimately increase in morbidity and mortality (Barker et al., 2011; Holmes, 2007). Neumann et al. (2005) found that the physical functions in terms of Barthel Index are generally lower in patients who are at risk or in malnutrition. Allison (2000) reported that with a certain level of weight loss, it was associated with the decrease of muscle strength and physical fitness. With the generalized decreased in health condition, it had been widely reported that the length of hospitalization for patients were prolonged (Marshall et al., 2013; Visvanathan et al., 2004).

Even though it is a chronic disease, it can lead to severe life threatening consequences (Ní Bhraonáin & Lawton, 2013). Studies reviewed that although malnutrition was not directly associated with death; the mortality rate for patients with malnutrition was higher than patients without malnutrition (Charlton et al., 2012; Asiimwe et al., 2014).

1.1.3 Malnutrition and geriatric hip fracture

Malnutrition is a common problem affecting elderly patients, and so do the patients with fractured hips. Statistics showed that up to 46% of the elderly patients with
fractured hip were having malnutrition or poor nutritional status (Lumbers et al., 2001; Paillaud et al., 2000). Trauma patients are at a higher risk of developing malnutrition after the injury due to pre-operative semi-starvation. The pre-operative fasting time may be prolonged due to long delay of the surgery. Moreover, energy and protein demands may be increased with the fracture and the subsequent surgery for repairment. An orthopaedics surgery may be delayed due to social problem and pre-existing medical illnesses such as heart diseases and infections (Lau et al., 2010). Patients may also have poor appetite due to severe pain, nausea and vomiting induced by the injury. Carlsson et al. (2005) found that less than half of the geriatric hip fracture patients have their appetite as good as before the trauma. Protein-energy malnutrition may develop in fractured patients regardless of pre-existing malnutrition status.

Malnutrition decreases the physical functions in geriatric patients. This greatly affects the functional recovery of hip fractured patients during the rehabilitation phase. Avenell & Handoll (2010) reviewed that only half of the hip fractured patients could return to their own homes after being discharged from hospitals. Majority of the patients resided in nursing homes afterwards due to increased dependency in the activities of daily living (ADL). Li et al. (2012) found that the functional recovery in regards to the walking ability and ADL of the well-nourished geriatric hip fractured patients are significantly
higher than the mal-nourished patients. The long-term care costs for this group of patients will be huge.

1.2 Affirming the Need

1.2.1 Local setting and current practice

Local situation

Aging is one of the population problems that Hong Kong is facing now. In the 20 years between 1981 and 2001, the population of people aged 65 and above had dramatically increased from 6.6% to 13.3%. It is also observed in the population pyramid that people aged between 25 and 65 occupied the largest proportion and was increasing in similar trend as above (Census and Statistic Department, 2012). It is expected that the population will continue to grow in the future. Therefore, it is foreseeable that aging will continue to be a great challenge to Hong Kong and cause huge economic burden to society. Over the decades, billions of Hong Kong dollars were spent for the healthcare expenditure every year (Tsang, 2013). The total sum of this expenditure was increasing year by year.
In a local adult Orthopedics & Traumatology (O&T) acute unit, the occupancy rate of elderly aged 65 and above is high. According to the statistics provided by the O&T unit, elderly patients accounts for over 80% of the total admission. People are mostly admitted to this clinical setting due to musculoskeletal injuries for surgical treatments. More than 80% of the elderly admitted were having fractured hips; over 95% of the total number of fractured hip patients were aged 65 and above due to unstable gait and fall. An epidemiology study conducted in Hong Kong revealed that there were altogether more than 40,000 episodes of geriatric hip fractures during 2001-09 (Chau et al., 2012). Up to 30% of mortality rate was recorded 1 year after the surgery (Lyons, 1997; Roche et al., 2005).

The Geriatric hip fracture clinical pathway

Since the late 2000’s, a clinical pathway was introduced for the geriatric hip fracture patients aiming to provide standardized management for these patients. Geriatric hip fracture patients can therefore receive effective and prompt care provided by frontline staffs. The goal of this pathway is to improve the quality of patient care and to reduce the cost of healthcare. A multidisciplinary approach was adopted; different healthcare professions were involved in the group. Apart from orthopedic surgeons and nurses,
physiotherapists, occupational therapists and medical social workers were involved to provide rehabilitation programs and facilitate in patient discharge.

**Dietary intake and nutritional status**

However, dietary intake and nutritional status is not a concern in the clinical pathway. Dietitians are not involved in the team. A study stressed that although most of the healthcare providers acknowledged the importance of nutrition, nutritional interventions were less valued than the other treatments concerning the injury (Bell *et al.*, 2013). There is no standardized management guideline in handling malnutrition patients in the target O&T ward. Nursing staffs will arrange dietetic referral since patient is observed to have poor oral intake and looks under-weight according to their experiences. However, this practice is subjective and not effective in providing timely intervention in correcting patients’ nutritional status. Therefore, it is essential to develop an evidence-based practice guideline for frontline staffs in handling patients with such clinical problem.

1.2.2 Potential Innovation

In order to promote patients’ physical function and rehabilitation, researchers suggested the possibility in implementing protein supplement nutritional intervention for the geriatric hip fracture patients for better outcome since protein may benefit in building
up muscle strengths for these patients (Hershkovitz et al., 2007; Mizrahi et al., 2008).

There is an urge for the O&T unit to develop an evidence-based nutritional intervention to the existed clinical pathway in order to further promote patient’s post-operative rehabilitation outcome.

1.3 Research Question, Objectives and Significance

1.3.1 Research Question

By using PICO, the research question will be drawn as follow: “Is protein-rich nutritional intervention effective in promoting geriatric hip fracture patients for better rehabilitation outcome?”

Patient – elderly hip fracture orthopaedic patients aged 65 or above

Intervention – protein-rich nutritional intervention

Comparison – usual practice, no specific treatment

Outcome – promote rehabilitation in physical function
1.3.2 Aim and Objectives

The aim of this dissertation is to develop a routine protein-rich nutritional support intervention additionally to the geriatric hip fracture pathway in the target O&T ward. To promote better outcome of rehabilitation of hip fractured patients after surgery.

The objectives:

1. To gather and synthesis the empirical evidence on the effectiveness of protein-rich nutritional support intervention in promoting better outcome of rehabilitation for geriatric hip fracture patients.
2. To perform a quality assessment of the implementation potential of identified intervention from the literature reviewed.
3. To develop an evidence-based guideline for the use of the protein-rich nutritional support intervention for the target patients.
4. To evaluate the effectiveness of the guideline on promoting geriatric hip fracture patients’ post-operative outcome.

1.3.3 Significance

1. Build up a systematic evidence-based guideline on nutritional support; standardize the care to patients. A strong evidence-based practice guideline
could help healthcare professionals make the best clinical decision on the intervention on promoting the best patient outcome.

2. Improve quality of care to geriatric patients with hip fractures.

3. Promote post-operative outcomes for geriatric hip fracture patients. An effective evidence-based guideline on nutritional support could improve patients’ post-operative outcomes after an orthopedic surgery; the quality of care provided by healthcare professionals; and in turn reduces the burden of healthcare costs to society.
Chapter 2 Critical Appraisal

In order to enhance the quality of the evidence-based protocol, a comprehensive and systematic search of the literature on the clinical issue is essential. This chapter will include the search strategies for literatures and appraisal strategies on the quality of the studies found. A summary of the study characteristics and the quality of the studies will be provided.

2.1 Search and Appraisal Strategies

2.1.1 Search Strategy

A comprehensive and systematic electronic literature search was conducted during the period of April 2014 to September 2014. Three electronic databases namely PubMed, CINAHL plus (EBSCOhost) and ProQuest were included in the search. Three databases were selected in the search within ProQuest database namely Health Safety Science Abstract, British Nursing Index and ProQuest Medical library.

Keywords for electronic search used were “diet therapy”; “hip fractures” and “femoral neck fractures”. The searched result was then limited to clinical trials or randomized controlled trials, and elderly patients. At this stage, 26 articles were retrieved.
from PubMed, 13 from CINAHL plus, and 4 from ProQuest making a total of 43 articles. The 4 articles from ProQuest were all from the database named British Nursing Index. Manual search was also performed by accessing the related citations from the 43 articles found. Three additional articles were extracted from PubMed which added up to a total of 46. Abstract of these articles were retrieved and screened under the inclusion and exclusion criteria. After checking for duplication, 6 articles were selected. Logistics of the search strategy was illustrated in Appendix I. All of the 6 articles were written in English. Full text was retrieved through the databases and all are available and retrievable.

2.1.2 Inclusion and Exclusion criteria

All controlled trials (CT) and randomized controlled trials (RCT) were included. Due to language barriers, studies in English are preferable. The target participants of the studies were elderly aged 65 years or above in both gender who suffered from a fractured hip and admitted to a hospital for an orthopaedic surgery. The intervention should be oral nutritional supplements which are protein-rich. Outcome measures should focus on post-operative and rehabilitation outcomes. Studies comparing different kinds of protein-rich oral supplements or containing commercial sponsorship will be excluded.
2.1.3 Data Extraction

The 6 studies selected were all RCTs and were written in English. The data from each study were extracted into a table of evidence which will focus on the study design, patient characteristics, intervention(s), comparison, length of follow-up, outcome measure(s), and the effect size. The table of evidence is enclosed in Appendix II. Interventions combined protein supplements with other substances will be omitted in the table in order to have a better comparison with other studies.

2.1.4 Appraisal Strategies

All of the 6 RCTs were evaluated and rated for their level of evidence by using the checklist provided by Scottish Intercollegiate Guidelines Network (SIGN) version 2.0 from Healthcare Improvement of Scotland. The methodology of the studies will be evaluated in order to check if the overall effect is due to the study intervention.

According to the checklist, the overall quality of each study will be rated as: high quality meta-analyses, systematic review of RCTs, or RCT with very low risk of bias (1++); well-conducted meta-analyses, systematic reviews, or RCTs with low risk of bias (1+); meta-analyses, systematic review, or RCTs with high risk of bias (1-); high quality systematic review of case control or cohort or studies with very low risk of confounding or bias, and high probability that the relationship is causal (2++); well-conducted case
control or cohort studies with low risk of bias and moderate probability that the relationship is casual (2+); case control or cohort studies with low risk of bias and a significant risk that the relationship is not casual (2-); non-analytic studies such as case report and case series (3); and expert opinion (4) (SIGN, 2012). Shown in Appendix III.

2.2 Results

2.2.1 Summary of study characteristics

2.2.1.1 Study design and country

Among the six studies retrieved, all of them are randomized controlled trials dated from the year 2000 to 2013. Most of the studies were conducted overseas in Spain, Australia and Sweden (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Espaulella et al., 2000; Tidermark et al., 2004). One study was conducted in Hong Kong (Myint et al., 2013).

One of them employed double-blinded method; both patients and investigators were kept innocent about the group allocation (Espaulella et al., 2000). Another one used single-blinded design, investigators who responsible for data collection did not know about the group allocation (Myint et al., 2013). For the remaining four studies, both
investigators and participants knew the group allocation (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Tidermark et al., 2004).

2.2.1.2 Patient characteristics

Altogether 539 patients with hip fractures were being studied in the six studies (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Espaulella et al., 2000; Myint et al., 2013; Tidermark et al., 2004). All of them were having an average age over 80 years old. Four studies investigated both male and female patients (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Espaulella et al., 2000; Myint et al., 2013). The remaining two studies investigated female patients only (Cameron et al., 2011; Tidermark et al., 2004). Female patients were in a larger proportion than male patients with hip fractures. The ratio is about 8:2 (female: male).

2.2.1.3 Nutritional status and assessment tools

For the nutritional status, different studies used different assessments and screening tools to assess participants’ nutritional statues. To summarize, the MNA (The Mini Nutrition Assessment), the MUST (Malnutrition Universal Screening tool), biochemical tests and anthropometric measurements were being used.
MNA is a validated screening tool which decided for elderly patients aged over 65 to identify if they were at risk or suffering from malnutrition. It contains 18 questions concerning patient’s BMI, appetite, eating habit, mobility, neuropsychological problems, and calf/ mid-arm circumference. (Barker et al., 2011; Huhmann et al., 2013). A total score from 0 to 30 will be obtained after completing the questionnaire. If patients obtained 17 points or less, they were identified as malnourished; 17-23.5 points indicating at risk of malnutrition; and 24-30 points indicating patient is in a normal nutrition status. (Huhmann et al., 2013).

MUST is an assessment tool decided to detect under-nutrition, at risk of malnutrition and as well as obesity for hospitalized and institutionalized patients. It is a five-step screening tool concerning about patients’ BMI, recent weight loss, and diseases that may contribute to malnutrition such as swallowing difficulties after having a stroke or head injuries etc. (Todorovic et al., 2011). An overall score will be obtained identifying patient is at low risk, medium risk or high risk of malnutrition. Dietetic referral and nutritional intervention were indicated by the scoring system. However, this assessment tool was not validated for renal patients (Barker et al., 2011).

Three studies used biochemical tests and anthropometric measures to identify the nutritional status of the participants (Cameron et al., 2011; Espeulella et al., 2000;
Tidermark *et al.*, 2004). One study measured the BMI (body mass index, body weight/height; kg/m\(^2\)) and MAC (mid-arm circumference; cm) to estimate the nutritional status of participants (Espaulella *et al.*, 2000). With BMI less than 18 kg/m\(^2\) and/or MAC less than 20 cm, participants will be categorized as undernourished. Another study measured the serum albumin level (g/l) and MAC to estimate the nutritional status (Cameron *et al.*, 2011). Blood samples were obtained on admission and sent to laboratories for tests. Serum albumin levels were then calculated. With serum albumin level less than 35 g/l and MAC less than the 10\(^{th}\) percentile for women aged over 70, the participant is categorized as severely undernourished. If participants fulfilled either one of the two criteria, they are undernourished. The last one study used BMI as the parameter for nutritional status (Tidermark *et al.*, 2004). This study only recruits patients with BMI less than 24 kg/m\(^2\). However, it did not provide a definition to the BMI index. Nutritional status with the same BMI value will be different in different boundaries.

To summarize, four of the studies studied patients with normal or mildly under-nourished (Botella-Carretero *et al.*, 2008; Botella-Carretero *et al.*, 2010; Espaulella *et al.*, 2000; Myint *et al.*, 2013). One studied patients of under-nourished (Cameron *et al.*, 2011). The last one (Tidermark *et al.*, 2004) did not specify the nutritional status of patients.
The MNA is a comprehensive, tailor-made for the aged, and it is a more user-friendly assessment tool for nutritional status. Therefore, MNA will be employed as the assessment tool in the evidence-based guideline. (Appendix IV)

2.2.1.4 Intervention, comparison and the length of follow up

All of the six studies administered ready-to-use liquid oral nutritional supplements (ONS) to participants (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Espaulella et al., 2000; Tidermark et al., 2004; Myint et al., 2013). The supplements are all protein-rich in nature and provide additional amount of energy in addition to the usual diet provided by the hospital. The amount of protein administered to patients per day ranging from 17.6 g to 40 g. One study also compared the effect of powdered protein supplement with liquid supplement (Botella-Carretero et al., 2008).

Patients in control groups (n= 164) received usual standard care provided by the hospital as to the patients in the intervention group but without the ONS (Botella-Carretero et al., 2010; Botella-Carretero et al., 2008; Cameron et al., 2011; Myint et al., 2013; Tidermark et al., 2004); or the ONS was replaced by a placebo which contains non-protein energy only (Espaulella et al., 2000).

Two studies administered the ONS intervention before the orthopaedic hip surgery (Botella-Carretero et al., 2010; Espaulella et al., 2000). Another three administered the
intervention after the surgery (Botella-Carretero et al., 2008; Cameron et al., 2011; Myint et al., 2013). One did not specify when the intervention was started (Tidermark et al., 2004). Four of the studies administered the intervention as a short-term treatment during patients’ hospitalization (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Myint et al., 2013; Tidermark et al., 2004); while the other two studied the effect of ONS for 40 days and 60 days respectively (Cameron et al., 2011; Espaulella et al., 2000). Nearly all of the studies conducted the in acute settings while one was conducted in a rehabilitation setting (Myint et al., 2013).

The length of follow up varied. Two studies evaluated the short-term effects of ONS (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010). The others evaluated the relatively long-term effect of ONS from 28 days to 360 days.

2.2.1.5 Outcome measures

There are altogether 17 outcomes evaluated in the 6 studies which can be categorized into 3 groups: nutritional outcomes, functional outcomes and other outcomes.

Nutritional outcomes are: change in serum albumin level, change in body mass index, change in mid-arm circumference, change in triceps skin fold, and change in body weight. Functional outcomes are: functional independency measure score, elderly mobility scale, days from surgery to mobilization, Barthel Index, Mobility Index, and independency of
ADL (activities of daily living). Other outcomes include: complication rate, infection episode, hospital length of stay, mortality rate after fracture, emergency department attendance after discharge, and HRQoL (health-related quality of life).

Functional Independence Measure (FIM) is a validated assessment tool assessing patient’s degree of disability. It contains 18-items on a 7-point scale from fully dependent to fully independent assesses patients’ ability on activities of daily living such as personal care, mobility, sphincter control, mobility, communication and social cognition (Hamilton et al., 1994; Mackintosh, 2009). Scores range from 18 to 126 indicating patient’s level of function from fully dependent to highly independent.

Elderly mobility scale (EMS) is a validated assessment tool assessing elderly patients’ performance on mobility in the basic activities of daily living such as gait, balance and transfer. It consists of 7 items make up to a score ranging from 0 to 20. It indicates if the patient is totally dependent to totally independent in mobility (Nolan et al., 2008; Smith, 1994).

Barthel Index (BI) is a validated assessment tool in evaluating patients’ level of ability in performing activities of daily living concerning the independence in mobility, transfer, stairs walking, feeding, dressing, grooming, bathing, toilet use, bladder and
bowels. Scores range from 0-20 will be obtained. The higher the score indicates the higher independence of the daily activities (Collin et al., 1988).

Mobility Index (MI) refers to the Rivermead Mobility Index which is also a validated assessment tool measuring patients’ disability in mobility aiming at providing quantified evidence for healthcare professionals on the degree of mobility disability of patients. It consists of 14 questions about the ability of activities and one direct observation. A maximum of 15 points will be scored indicating the highest ability in mobility performance (Collen et al., 1991).

Health-related Quality of life (HRQoL) measures the perceived quality of life and well-being of an individual. There are many assessment tools in assessing the health-related quality of life, one of the six articles employed the EQ-5D questionnaire (The EuroQOL five dimensions questionnaire) to assess patients’ health related to the quality of life (Tidermark et al., 2004). It assesses individual’s health in 5 dimensions: self-care, mobility, usual activities, anxiety/depression, and pain/ discomfort (Gusi et al., 2010). Each dimension is divided into three levels which are: having no problems, some or moderate problems, and extreme problems (Rabin & Charro, 2001). The scoring system indicates 0.00 as the worst health state and 1.00 as full health.
In summary, most of the studies compared the change of outcomes measured between intervention groups and control groups. Pre-test and post-test results comparisons were undergone significance testing to check for the level of reliability. Different statistical tests were being used according to the data types. The p-values ranged from 0.00 to 1.00 were reported in the studies. A larger p-value indicates less likely to reject the null hypothesis, which a smaller p-value indicates a more significant results. Most of the studies use 0.05 as a cut-off point.

2.2.2. Summary of quality assessments

According to SIGN checklist, for RCT studies, the rating scale refers to “1++”, “1+” and “1-” according to the quality respectively. Rating for non-RCT refers from “2++” to “4” (SIGN, 2004). Three rated “1++” (high quality) (Botella-Carretero et al., 2010; Espaulella et al., 2000; Myint et al., 2013) means a majority of the criteria in the SIGN checklist were met, and little or no risk of bias created due to the methodology. Two studies were rated “1+” (well-conducted studies) (Botella-Carretero et al., 2008; Cameron et al., 2011), some criteria were not met and may have chances to create bias. One was rated “1-” (study has high risk of bias) (Tidermark et al., 2004). Marking of each studies were shown in Appendix III.
2.3 Summary, Discussion and Synthesis

Among the 17 outcomes evaluated in the 6 studies, majority showed positive effect of oral nutritional supplements on the geriatric hip fracture patients. The most significant outcome measures are the change in serum albumin levels and the complication rate. There are two studies showed positive, significant results in intervention groups. Botella-Carretero et al. (2010) evaluated the effect of short-term oral nutritional supplements on the change in serum albumin level. The result showed that in 2 days and 7 days after the surgery, the serum albumin level decreased less in the intervention group. Another study evaluated the long-term effect of oral nutritional supplements on serum albumin levels (Tidermark et al., 2004). It revealed that the albumin levels of intervention group increased higher than the control group during 180 days and 360 days follow-up in a long run. The decrease of serum albumin levels immediately after the surgery can be explained by the direct effect of the surgery due to blood lose peri-operatively which causes significant protein lose. After surgery, serum albumin level may increase gradually. Study found that the post-operative albumin gain can benefit the rehabilitation outcome (Mizrahi et al., 2008).

Although researchers had pointed out the positive effect of albumin on post-operative rehabilitation outcome, some of the results from the 6 articles showed
contradicting results. All of the 6 studies failed to show significant functional outcomes. Even though all results showed positive effect of the oral supplements, they are not statistically significant which means there is chance of having errors in reflecting the truth. One study pointed out the importance of the patient compliance to the oral supplements. Compliance directly affects the protein intake by the participants and the outcome comparisons between the intervention groups and control groups. Only 2 of the 6 studies reported the compliance rate of around 64 to 77% (Espaulella et al., 2000; Myint et al., 2013). One study pointed out some of the reasons that affected the compliance rate: patients did not like the taste of the oral supplements; experienced nausea, abdominal bloating, or diarrhea caused after consuming the supplements (Myint et al., 2013). However, as mentioned in some of the studies, it is difficult to find a supplement that fits every participant (Cameron et al., 2011; Myint et al., 2013).

Complication was greatly reduced in the intervention groups. Espaulella et al. (2000) evaluated the overall complication rate after the hip surgery. This study counted the number of patients who had more than 1 episode of complication during the follow up period. Delirium, urinary tract infection, bedsore, sepsis, and the need for blood transfusion are the most common complications reported in the studies after the hip surgeries (Espaulella et al., 2000; Myint et al., 2013). Myint et al. (2013) evaluated the infection episode alone as an outcome measure. They found significant result of patients
on oral supplements have less infection episode than control groups. Another study
generated the ancillary analysis from the data collected, they found that the more protein
intake, the less complication risk the patient has (Botella-Carretero et al., 2010).

To conclude, the change of serum albumin level and the reduced complication rate
are the most beneficial outcomes in administering the protein-rich oral nutritional
supplements to hip fracture patients. This dissertation will mainly focus on these two
outcomes of the geriatric hip fracture patients in the target orthopaedics ward.
Chapter 3 Translation and Application

Polit & Beck (2004) stated that after the synthesis of the evidence for the new intervention, the implementation potential should be assessed. Therefore, the implementation potential will be assessed in this chapter before developing the proposed clinical guideline of nutritional support to geriatric hip fracture patients at the target clinical ward. The implementation potential will be discussed in terms of transferability and feasibility of the findings and cost-benefit ratio.

3.1 Target setting

The target setting of this evidence-based guideline is an acute orthopedics and traumatology (O&T) ward in a public hospital in Hong Kong. The target ward has 38 beds whereas the occupancy rate is high that reached 91.8% (+/- 15.6%) on average per month. Patients admitted to the this O&T ward due to conditions involving the musculoskeletal system in both surgical and non-surgical means such as injuries, bone tumors, degenerative diseases and congenital diseases.

3.2 Target audience

According to the aim of this project and the reviewed evidence, the inclusion criteria are patients who admitted to the O&T ward aged 65 or above in both sex and having hip
fractures upon admission. A hip fracture is defined as the fractures of the femur head, the femur neck, the trochanters, and the inter- or sub-trochanteric region of the femur. The fracture in acetabulum and the femoral shaft below the sub-trochanteric region are not included in hip fractures (Segen, 2002). Therefore, patients diagnosed of fractured neck of femur and/or trochanteric fracture and orthopedic surgery was considered to be the treatment of choice will be recruited.

Based on the six studies reviewed in chapter 2, patients who have one or more of the following conditions will be automatically excluded (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Espaulella et al., 2006; Myint et al., 2013; Tidermark et al., 2004):

- Requiring tube feeding;
- Overweight (BMI ≥ 25);
- Metastatic cancer;
- Acute or chronic renal failure;
- Hepatic insufficiency or cirrhosis;
- Severe heart failure (defined as New York Heart Association class III or IV);
- Respiratory failure;
- Any gastrointestinal condition that preclude patient from adequate oral nutrition intake.
After screening patients by the inclusion and exclusion criteria, all patients who are eligible for the innovation will be included. In order to minimize the potential risks to patients in implementation of the innovation, informed consent will be obtained from patients by nurses. They were then referred to hospital dietitians for assessment and select the suitable oral supplements in additional to the meal provided by the hospital. Recruitment procedure is shown in Appendix V.

3.3 Transferability of the findings

3.3.1 Setting and audience

Among the six studies, all of them were conducted in hospital based settings. Three were conducted in acute orthopedics wards (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Espaullella et al., 2000). One was conducted in a rehabilitation ward of a hospital (Myint et al., 2013). The remaining two did not report the location of studies which were in an acute or non-acute hospital setting. However, all of them were conducted in hospital-based setting. Consider the physical environment; the local target setting is comparable to the studies reviewed.

Compared with patients’ characteristics, patients in the local target setting are having similar characteristics with the six studies reviewed. Comparisons were made in terms of age, sex, medical background, mobility level, level of dependency and nutritional status
3.3.2 Objectives of the guideline

The objective of the proposed project is to provide additional nutritional support to geriatric hip fracture patients in order to promote a better post-operation and rehabilitation outcome of the group of patients.

3.3.3 Philosophy of care

The objective of the guideline is similar to the philosophy of care of the six reviewed studies. Given that the mission of the Hospital Authority is “helping people stay healthy”; and the department mission of the local target setting is “to provide client-oriented holistic care to orthopaedics patients… aiming at enhancing patients regain capability to return to the community.”, the proposed innovation also aimed at promoting better patient’s outcome which enhancing patients return to community. Therefore, the proposed innovation is transferable to the local target setting.

3.3.4 Number of patients being benefited

Geriatric hip fracture patients were admitted at any period of time in the target setting. According to the statistics from the target setting, there are approximately 200 target audiences on average admitted to the target ward every year. By estimation, 90% of the total geriatric hip fracture patients who are indicated for the innovation will be benefited. Therefore, around 180 target patients will be benefited from the proposed
project every year which is significantly large.

3.3.5 Duration of implementation and evaluation

The implementation and evaluation of the proposed innovation will be divided into three phases: the planning phase, the pilot phase, and the implementation and the evaluation phase. The total duration will be 22 weeks.

The duration of the planning phase is 3 weeks. Communication with the staff from management level and frontline will be conducted. A revision of the innovation will be made afterwards. Another 3 weeks will be used for the pilot and evaluation. For the final phase, the full implementation and program evaluation will take up to 16 weeks (Appendix VII).

According to the six studies reviewed, the average duration of the implementation of the innovation is 30.4 days (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Espaulella et al., 2000; Cameron et al., 2011; Myint et al., 2013; Tidermark et al., 2004). Four studies distributed the oral supplements before/after surgery until patients were discharged, and the other two ranged from 40 to 60 days in total. Patients eligible for the innovation will be recruited in the during the full implementation period. And the innovation will be completed until patients were being discharged from hospital.
3.4 Feasibility

Apart from the transferability, feasibility of the innovation is another important key for the successfulness of the project. The feasibility of the innovation will be discussed from organizational level to operational level; from staff acceptability to the availability of resources.

3.4.1 Administration support and organizational climate

The hospital supports any research-based projects in order to improve service quality and safety continuously. The “vision, mission and values” (VMV) of the service provided by the Hospital Authority are all aimed at “putting people first” (Hospital Authority, 2014). It targeted at providing highly professional and people-centered healthcare services. In order to support quality improvement in the healthcare services, a nursing specialist team (NS team) was set up in the target O&T department. The NS team was targeted in support for research-based quality improvements in patient care. Members of the NS team are nursing consultant (NC), advanced practicing nurses in orthopaedics (APNs) and orthopaedics surgeons.

The proposed innovation aimed at providing the target patients with quality care for better patient outcome in evidence-based basis. Extra workload may be created. A report includes the evidence for the innovation, aim and objectives, planning and the cost-benefit-ration will send to the hospital administration and the NS team in order to
gain support for extra manpower required for the innovation.

3.4.2 Interference with current staff functions

The innovation may have a little interference with the current daily routine work in the target setting. The innovation involves the distribution of additional oral supplements to the target population. Nurses are responsible to assess patients’ eligibility for this innovation soon after patient’s admission according to the inclusion and exclusion criteria and make referral to dietitians. Since the oral supplements are recommended to be consumed between meals during hospitalization, assistances are required for patients who are partially or completely dependent in feeding. However, feeding patients can be dedicated to health care assistance (HCA) in wards. Nurses are responsible for observation and monitoring of patients’ condition. When patient’s condition changed and/or contra-indicated for the oral supplement, nurses should terminate the innovation.

To enhance the best outcome of patients, briefing sessions for the project will be organized with the potential stakeholders. Thus, additional workload is required in the early stage of the project. According to the statistics from the target setting, more than 80% of the geriatric hip fracture patients are independent or partially independent in ADL, approximately 20% of these patients required extra manpower for feeding. And there was sufficient manpower in supporting staff in the target setting; the interference with the current routine work is minor. Therefore, addition manpower is not required.
3.4.3 Staff acceptability, freedom to carry out or terminate innovation

The nursing staff of the target ward participates the innovation has the freedom and authority to carry out or terminate the innovation whenever undesirable outcomes observed from the target population.

Staffs’ acceptability of a new intervention can be demonstrated by their job satisfaction and turnover rate of frontline staffs. Implementing the innovation will slightly add additional workload to current ward routine, frontline staff may feel stressed. However, workload will decrease in long term. Based on the six studies reviewed, the additional protein-rich oral supplements enhance patients a better post-operative outcome. It reduces the complication rate and significantly increases the body mass index of patients. This greatly reduce the workload that induced by post-operation complication. Studies found that when workload reduced or is low, nurses’ job satisfaction will be higher and the turnover rate would be lower (Lindqvist et al., 2014; Yom, 2013). Nurses may be motivated because their job is protecting people’s health (Kudo et al., 2010). Therefore, a brief introduction of the aim and objectives of this project should be emphasized in the briefing session for frontline staff before the full implementation of the innovation.
3.4.4 Availability of resources

Health assessment, health history taking, BMI calculation, and assessment on the independency on activities of daily living (ADL) are basic nursing knowledge. Therefore, frontline nursing staff should be competent in assessing patients’ eligibility for the innovation according to the inclusion and exclusion criteria. Assessment tools are for ADL is already available and was a routine practice upon admission to the target O&T setting. An additional checklist will be designed and provided for frontline staff to assess patients’ eligibility. Administrative support in authorizing nurses’ right to access patients’ health history from hospital database is required.

The oral supplements are already available from the hospital kitchen. Feeding is one of the basic patient care skills. Training session is not required.

During the evaluation phase, patients’ outcome including the change serum albumin level and the complication rate will be assessed by ward nurses. All of the data required for evaluation can be accessed through the hospital database electronically. Authorization for the access of the data is required from the hospital prior to the evaluation phase.

3.5 Cost-benefit-ratio of the innovation

3.5.1 Potential risks

The proposed innovation is the distribution of additional oral supplement to hip
fracture patients. The risk of implementing this innovation is low. Based on the six studies reviewed, there are no adverse effects on patients reported.

In general, WHO recommends the daily protein intake for human is 0.8 g/kg according to body weight (WHO, 2007). Volkert et al. (2006) recommended that for orthopedics patients, the daily protein intake should be higher at 1.0-1.2 g/kg or more in order to restore muscle mass. According to the six studies reviewed, the additional protein supplements provide patients with 25.2 g protein on average per day. Ready-to-use oral supplements which available in hospital provides 9 to 19.4 g of protein per can (Appendix VIII). The target additional protein intake provided to patients will make according to the average amount in the six studies. Since the total amount of protein provided is comparative, the risk of overload is low.

On the contrary, when there are no additional oral supplements provided to the target patients, their nutritional status may decline due to poor appetite and long pre-operative fasting time (Carlsson et al., 2005). Sarcopenia, the loss of skeletal muscle mass occurs when protein breakdown exceeds synthesis (Thomas, 2007). Poor nutritional status, aging and prolonged bed rest are the reasons for muscle wasting. Excise capacity will be decreased as a result.

3.5.2 Potential benefits

If the innovation was successfully implemented to the target setting, the serum
Albumin level and the post-operation complication rate for geriatric hip fracture patients will be improved. Serum albumin level may increase up to 20.7% (Botella-Carretero et al., 2010; Tidermark et al., 2004). Common complications after hip surgery indicated in studies were: delirium, UTI, bedsore, sepsis and the need for blood transfusion (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Espaulella et al., 2000; Myint et al., 2013). The complication rate after the surgery may decrease up to 14.5% (Espaulla et al., 2000; Myint et al., 2014). By maintaining the serum albumin level, the rate of muscle loss may decrease. It enhances the post-operation rehabilitation. And by decreasing the complication rate, prognosis of the fracture will be enhanced.

In general, the burden of taking care of geriatric hip fracture patients can be minimized. And patient’s quality of life in the rehabilitation process will be promoted.

3.5.3 Potential cost

Since all the hardware for the implementation of the innovation is already available, the material cost is limited to the staff training. The staff training for this project only consists of a half hour briefing session prior to the implementation of the innovation. The total cost for staff training is $2323.5 (Appendix IX). The cost include a one-hour train-the-trainer session, a one-hour briefing session for all of the frontline staff which include nurses and health care assistances in the target setting, fee for the training venue and the cost for training materials. Besides, a one-page easy-to-read leaflet will be
designed and distributed to patients who are eligible for the innovation. In long run, the expenditure is cost effective.

The potential non-material costs are subject to the staff attitude and patients’ compliance towards the innovation. Frontline staffs including nurses and supporting staff in ward may feel uneasy at the beginning of the project. Therefore, it is important to brief the staff the potential benefits of the innovation in the briefing session prior to implementation of the project. Good communication with supportive attitude between the staffs should be shown in order to gain support from them for the project. The communication plan will be discussed in detail in Chapter 5.

Although patient’s compliance on the oral supplements was not being reported in the six studies reviewed, patients’ compliance will be one of the challenges for the innovation. In order to ensure the compliance rate, patients will receive the information leaflet about the innovation. Patients’ consent will also be obtained with the agreement for participation. And patient’s willingness to join this project should always be respected. During the dietitian assessment, patients were provided choices for their favorite favor of the oral supplements if possible.

In view of the above discussion, it is concluded that the proposed innovation can be implemented because it is transferable, feasible and cost effective to the target setting.
The report will proceed to the development of an evidence-based practice guideline for
the oral supplements for geriatric hip fracture patients.
Chapter 4 Development of an Evidence-based Practice Guideline

4.1 Background

The innovation of this program is an evidence-based practice in nutritional support for elderly patient with hip fracture. After affirming the implementation potential of the proposed innovation in terms of transferability, feasibility and cost-benefit ratio, this chapter will proceed to the development of the evidence-based practice guideline. Evidences will be extracted from literatures and gathered in the form of recommendations for the practice of the nutritional support for geriatric hip fracture patients.

The evidences and recommendations are graded by the guideline developed by the Scottish Intercollegiate Guideline Network (SIGN, 2004). (Appendix X). Evidences are graded from “1++” to “4” whereas “1++” means highest quality level of the evidence and “4” refers to the lowest quality level of evidence. Grading of the evidences is the consideration for the level of power of the recommendation. Grading for recommendations are from “A” to “D” whereas “A” refers to higher quality of evidences.

4.2 Title of the Evidence-based Practice Guideline

An evidence-based nutritional support guideline for geriatric hip fracture patients to promote post-operative rehabilitation.
4.3 Aim and objectives

It aimed at developing a feasible and cost-effective oral nutritional support to geriatric patients with hip fracture.

The objectives are:

- Summarizing the evidence for protein-rich oral supplementation for geriatric patients with hip fracture undergoing hip surgery;
- Provide nurses in the local setting with structured and standardized oral nutritional support protocol for geriatric patients with hip fracture.

4.4 Target group

4.4.1 Target users

Nurses working in target O&T unit taking care of geriatric patients with hip fracture undergoing hip surgery.

4.4.2 Target patient population

Patients admitted to the target setting aged 65 or above with hip fracture and meet the inclusion and exclusion criteria described in chapter 3.2.

4.5 Recommendations and evidences

Evidences were extracted from literature and its level of quality was graded by the
guideline developed by Scottish Intercollegiate Guideline Network (SIGN, 2004). Recommendations were divided into four categories: (1) importance of innovation, (2) patient screening, (3) intervention, and (4) evaluation. Evidences were gathered to support the recommendations. Each recommendation was graded again according to the level of quality of the evidences under SIGN guideline (Appendix XI).

It is recommended that nutritional support is important for elderly patients with hip fracture for better rehabilitation outcome. Nutritional screening should be performed upon admission. Patients’ health condition should be screened for fitness for the innovation. Once patient is eligible for the innovation, the oral supplements should be given as soon as possible after admission and before surgery. One to two cans of the ready-to-use oral supplements should be provided according to patient’s nutritional requirement after assessment by the dietitian. The total amount of protein gain from the oral supplements will be standardized and ranged from 17.6-40 g (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Espaulella et al., 2000; Myint et al., 2011; Tidermark et al., 2004). The supplements should be given in short-term basis, during patients’ hospitalization upon. The change of serum albumin level and complication rate will be evaluated.
Chapter 5 Plans for communication and Pilot

In order to ensure smooth transition and successful adaptation of the innovation, a thorough planning and preparation is essential (Claire, 2006; MacPhee, 2007). MacPhee (2007) stated that a successful change depends on the power derived from formal explicit positions of authority or from informal positive relationships with others. Therefore, a communication plan with the potential stakeholders which includes the authority and peers for this new nutritional support for geriatric hip fracture patients is essential. In this chapter, a communication plan with different stakeholders will be developed. And a pilot test will be designed to test the feasibility of this nutritional support project in the target setting.

5.1 Communication plan

A good communication plan is important and essential. Formal and informal network from human resources are the source that motivate people’s attitudes, behaviors, and abilities to do the work (Kanter, 1997). Therefore, support from co-workers is important. Communication with the potential stakeholders for the project is vital before the implementation. The communication plan will start with the identification of the stakeholders. The main theme of the communication with the stakeholders is demonstrating the disadvantages of the current practice and the benefits gain from the
innovation. The communication flow is shown in Appendix XII.

5.1.1 Identification of stakeholders

Stakeholders of the nutritional support project from the management level are the Department Operation Manager (DOM), Ward Manager (WM) and Chief of Service (orthopaedics and traumatology) (COS). They are the key persons from the authority with formal power that essential for the approval of the project.

The key stakeholders who work in frontline are ward nurses including Registered Nurses (RNs) and Enrolled Nurses (ENs), Healthcare assistance (HCA), orthopaedics surgeons, and dietitians. The above mentioned are the key persons who influencing the implementation of the project. Lastly, patients and their caregivers are also one of the important stakeholders.

5.1.2 Communication with stakeholders

The process of communication with all stakeholders should be planned comprehensively. After identifying the key stakeholders, a communication team will be formulated in order to facilitate the communication process with different stakeholders. The team will consist of one RN and one EN, one HCA, one nurse specialist (orthopaedics) (NS), one Advanced Practicing nurse (APN), one Ward Manager (WM), and one orthopaedics surgeon.

The “top-down” strategy will be employed for the communication plan. It means the
communication will start from approaching the management level first to persuade them for the approval and support for the project. The communication will then proceed with the frontline healthcare providers which include frontline nurses, ward healthcare assistance, orthopaedics surgeons and dietitians. Frontline staffs are essential for conducting the programme in ward. Thus, support from the frontline staffs is essential. Last but not least, the team will approach the patients who are eligible for the programme and their caregivers.

5.1.2.1 Communication with management level

WMs of different O&T wards will be the first personnel who being contacted among the target personnel in the management level. WM positioned in the mid-level among all the key stakeholders involved and worked as intermediate between frontline and policy making. Thus, it will be more convincing to other personnel if the project is supported by WM. An individual meeting will be held with each WMs of different O&T wards. A precise description of the project, possible benefits gained from the innovation will be presented to the WMs in order to gain support. Amendments will be made according to WM’s comments on the project.

A group meeting with the DOM and COS of the O&T department will be held. The communication team will present the project to them. Together with a brief summary of the evidences, objectives and possible patient outcomes of the project, the cost-benefits
ratio, the action flow of the project will also be presented during the meeting. Again, the project will be refined according to the comments of these persons.

5.1.2.2 Communication with frontline staffs

Frontline staffs being involved in this project are RNs, ENs, HCAs, dietitians, and orthopaedics surgeons.

A meeting will be organized with the dietitians and orthopaedics surgeons. This meeting will be arranged by means of case conference and case sharing. Again, the aim and objectives of the nutritional support programme will be emphasized and promoted. In order to gain their support, it is open for discussion about the programme during the meeting. The programme will be refined according to their feedbacks.

Informal power source for nurses are mainly peers (Kanter, 1997). Peers not only can provide formal informational support, they also provide informal emotional support. Therefore, ward staffs including RNs, ENs, and HCAs will be approached first among the frontline staffs. However, peers may be the biggest obstacle in promoting innovative change in work. To overcome this barrier, Armenakis & Bedeian (1999) suggested a gradual introduction of change. It allows time for the staff to recognize the need to change and enhance skills to adapt to new innovation. Therefore, two identical one-hour briefing sessions will be arranged for ward frontline staffs. The briefing session will include the introduction of the programme and a Q&A session. In order to encourage the
frontline staffs to participate in the programme, misconceptions will be clarified and minimal influence to their working routine will be emphasized during these briefing sessions. To be persuasive, the Q&A session will be held by means of interactive discussion which aimed at collecting positive and negative feedbacks from the frontline staffs.

5.1.2.3 Communication with patients and their caregivers

Soon after admission, patients with hip fracture and eligible for the programme according to the inclusion and exclusion criteria mentioned in the earlier chapter will be selected. Information pamphlet containing essential information about the nutritional support programme will be distributed to patients and their next of kin or caregivers. Verbal consent will be obtained either from the patients or from their caregivers. Refusal of the oral supplements illustrates termination for participation.

5.2 Pilot study plan

After developing the communication plan, a pilot study plan should be discussed. It is an important step to determine the feasibility of the intervention and to confirm the design and operational processes of the intervention (Gardner et al., 2003; Leon et al., 2011). The pilot test also provides opportunities for refinement of the intervention. Unexpected difficulties can also be minimized and prevented in the future.
5.2.1 Objectives

- to test the feasibility of the design and workflow of the nutritional support programme;
- to identify any potential barriers and difficulties encountered by guideline users;
- to evaluate the patients compliance to the oral supplements;
- and to assess the satisfaction level of patients and nursing staff on the programme.

5.2.2 Subjects

The pilot testing will be conducted in one of the five O&T wards. Therefore, geriatric hip fracture patients and the frontline staffs in this ward were the targets of this pilot study.

5.2.3 Sample size and timeframe

Since pilot study is not a hypothesis testing, the sample size will base on pragmatics recruitment (Leon et al., 2011). According to the statistics from the O&T department, there are approximately 3.75 geriatric hip fracture patients admitted each week in each ward based on the inclusion criteria mentioned in chapter 3.2. The pilot testing will last for 2 weeks. Assume that there are 20% of the hip fracture patients having the condition(s) stated in exclusion criteria in chapter 3.2, there will be 6 patients eligible for the pilot testing in 2 weeks in the target ward. Thus, the sample size of patients in the pilot testing
is 6. Verbal consent will be obtained from the target patients by the ward nurses. The programme design evaluation and staff satisfaction will be evaluated by all frontline nurses in the target ward.

5.2.4 Methodology

The daily oral intake and output (I&O) of the target patients will be recorded during the testing period. Patients compliance to the oral supplements can be retrieved from the I&O charts. An individual interview will be conducted with the patients to assess their satisfactory level on the programme. Feedbacks from patients will also be collected.

To evaluate the programme design, workflow and staff satisfaction level, a focus group interview will be conducted. All nursing staff in the target ward will be invited. During the interview, nurses will be asked about their experience working on the programme; feedback on the briefing session; their satisfaction level on the workflow etc.

5.2.5 Pilot review

After completion of the pilot study analysis, the communication team will review the implementation of the innovation according to the suggested modification. A written report will be provided for the stakeholders in order to persuade them for the future full-implementation.
Chapter 6 Evaluation plan

A programme evaluation based on systematic assessment of the programme result should be established to evaluate the value or worth of the programme (Olson, 2014). And a good programme evaluation could provide evidence for continuous improvements of the programme. Therefore, a comprehensive summative evaluation plan evaluating the effectiveness of the nutritional support programme is developed. The evaluation plans based on patient outcomes, healthcare providers outcomes and system outcomes will be described in this chapter.

6.1 Outcome measures

The outcome measures will be divided into three aspects: patient outcomes, healthcare provider outcomes and system outcomes.

6.1.1 Patient outcomes

The aim of the nutritional support programme is to promote post-operation outcomes of geriatric hip fracture patients. Therefore, as mentioned in chapter 1, the serum albumin level and the post-operation complication are the most significant patient outcomes measured in the reviewed studies (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Espaulella et al., 2000; Myint et al., 2013; Tidermark et al., 2004). Therefore, the evaluation of the nutritional programme will
focus on the change of serum albumin level and the complication rate of the target patients.

The change of serum albumin level will be measured in gram/litre (g/l) for comparison. The average stay in the target ward is 28.41 days which is comparable to the reviewed evidence with 30.4 days in average. Some of the reviewed evidence had long follow period dated from 180 to 360 days which is considered to be too long and may create high dropout rate. Thus long follow up will not be considered in this project.

Post-hip surgery complications after surgery and before discharge from hospital will be recorded. Complications identified in the reviewed studies are: delirium, urinary tract infection, bedsore, sepsis, death and the need for blood transfusion (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Espaulella et al., 2000; Myint et al., 2013). The conditions listed above will be counted as post-operation complication.

Patients’ compliance to the nutritional supplements is also an indicator for the effectiveness of a programme. Therefore, the compliance to the oral supplements will also be evaluated.

6.1.2 Healthcare Provider outcomes

Frontline nurses satisfaction on the nutritional support programme will be evaluated in the healthcare provider’s aspect. A self-administered questionnaire will be designed and employed for the evaluation (Appendix XIII). The context of the questionnaire was
developed according to the Donabedian model for evaluating the quality of health care services which consist of three aspects: structure, process and outcomes (Donabedian, 1988).

6.1.3 System outcomes

Evaluation of the system outcome is the measurement of the system effectiveness. Any adverse events aroused from the programme will be evaluated. Both patients and healthcare providers will be considered. Adverse effects on patients after the intake of the oral supplements will be focused although it is rarely reported in literatures. Examples are GI problems and allergy reactions. Human resources events from the frontline healthcare providers will be focused, such as the turnover rate and staff sick leave rate. The changes will be compared with previous statistics to check if it is directly related to the launching of the programme.

6.2 Sample size calculation

The study will last for 10 weeks in full implementation as planned. Therefore, the recruitment will last for 10 weeks in total. Patients with hip fracture admitted to the O&T wards will be selected according to the inclusion and exclusion criteria mentioned in the earlier chapters. The sample size calculation will base on the study design, outcome measures and the method of analysis.
The study is a before-after quasi-experimental design with no control group. The main outcome of the study measured is to determine the change of the serum albumin level upon discharge; t-test will be employed for data analysis. By taking 5% level of significance and 80% power, the sample size calculated is 123. By estimating the dropout rate to be 10%, the actual sample size required is 137. The recruitment period for 137 patients will be around 10 weeks as planned. As mentioned, there are approximately 3.75 geriatric hip fracture patients admitted in each O&T ward per weeks, four O&T wards will have 150 patients over 10 weeks. Thus the recruitment period and the target sample size matched.

6.3 Data collection and data analysis

During the evaluation period, statistical analyses will run by using the Statistical Package for the Social Sciences (SPSS) 22.0. Different data analysis methods are used to measure the outcomes.

6.3.1 Patient outcomes

Three outcomes of the patients will be evaluated: the change of serum albumin level, complication rate and the compliance rate. A data collection form was designed (Appendix XIV).

For each eligible patient for the programme, blood test for serum albumin level will
be taken soon after admission and on discharge. A two-tailed z-test will be performed in
order to determine if the change is due to the implementation of the programme.

Complications are also being evaluated. A t-test will be performed to determine if
the complication is reduced.

The Intake and Output charts of the patients will be retrieved and calculated for the
consumption of the oral supplements, the compliance rate will be calculated according to
the percentage of the consumption. Any adverse effects such as GI conditions and allergy
reactions will also be recorded in the charts.

6.3.2 Healthcare provider outcomes

To evaluate the satisfaction level of the front line nurses, a 5-point Likert scale
self-administered questionnaire will be distributed at the end of the study period. Half the
total number of nurses of each ward will be randomly selected by lottery method for the
questionnaire. Mean score of each statements of the questionnaire will be generated and
evaluated with the assistance of the descriptive data collected form the open-ended
questions in the questionnaire.

6.3.3 System outcomes

The adverse effect recorded from patients will be investigated accordingly in order
to look for improvement of the distribution of the oral supplements. For the staff turnover
rate and sick leave rate during the study period, it will be compared with the previous
period by using t-test.

6.4 Criteria for effective change

Among the three outcome measurements, patient outcome is the most crucial indicator for the effectiveness of the programme. Therefore the criteria for the effective change will mainly focus on patient outcome. According to the reviewed studies (Botella-Carretero et al., 2008; Botella-Carretero et al., 2010; Cameron et al., 2011; Espaulella et al., 2000; Myint et al., 2013; Tidermark et al., 2004), the criteria for effective change are:

- change in serum albumin level more than +1.45 g/l upon discharge from hospital;
- complication rate less than 45.3% after surgery and before discharge from hospital; and
- compliance rate more than 65% of the total consumption of the oral supplements.

For the staff satisfaction level, the overall score of the items in the questionnaire should be 3 or above on the 5-point Likert scale. Staff turnover rate and sick leave rate should be maintained the same level or reduced.
Chapter 7 Conclusion

Malnutrition is a common problem among elderly. Aging is one of the biggest problems faced by the healthcare sector in Hong Kong. Elderly occupied higher proportion of the total admission of the local public hospitals. In O&T settings, a high proportion of the elderly were being admitted due to hip fracture and required hip surgeries. Malnutrition also affects this group of elderly patients. However, nutritional status is always being neglected on the current practice of taking care of the geriatric hip fracture patients. And there is no standardized guideline in geriatric hip fracture patients’ nutritional care. A literature review revealed that oral protein-rich supplements can significantly promote the post-operation outcomes of the hip fracture geriatric patients. Therefore, an evidence-based translational nursing research on the nutritional supplementation on geriatric hip fracture patients is essential. A structured guideline in providing additional protein-rich supplements to the group of patients was developed. Moreover, an implementation which includes the communication plan and pilot test were also developed. An evaluation plan was designed to evaluate the outcomes of the programme.

In this study, the evidence-based nutritional support guideline is designed to improve the nutritional care to geriatric hip fracture patients with a better post-surgery
outcome. It is recommended to establish it in all O&T settings as usual practice in order to yield more benefits to the target patients in the future. Ultimately, it promotes patients’ health and reduces the complication rates.
References


management of childhood illness. *Bull World Health Organ* 75(Suppl 1), 87-96.


# Appendix I  Search Strategies

<table>
<thead>
<tr>
<th>Keywords</th>
<th>Database</th>
<th>PubMed</th>
<th>CINAHL plus (EBSCOhost)</th>
<th>ProQuest (Health Safety Science Abstract, British Nursing Index, ProQuest Medical Library)</th>
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</thead>
<tbody>
<tr>
<td>(a) Diet therapy</td>
<td>104,630</td>
<td>15,452</td>
<td>96,216</td>
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<tr>
<td>(b) Hip fractures OR Femoral neck fractures</td>
<td>28,568</td>
<td>6,540</td>
<td>36,855</td>
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<tr>
<td>(a) and (b)</td>
<td>161</td>
<td>123</td>
<td>4008</td>
<td></td>
</tr>
<tr>
<td>Limit to clinical trial or randomized controlled trial</td>
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<td>20</td>
<td>12</td>
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<td>Retrieved from related citation</td>
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</tr>
<tr>
<td>Filtered by inclusion and exclusion criteria</td>
<td>5</td>
<td>1</td>
<td>3 (dublicated with PubMed)</td>
<td></td>
</tr>
<tr>
<td>Total number of studies extracted</td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix I  Search Strategies (PRISMA 2009 Flow Diagram)

Records identified through database searching  
(n = 9242)

Additional records identified through other sources  
(n = 3)

Limited to clinical trial /randomized controlled trial  
(n = 61)

Limited to elderly patients  
(n = 43)

Full-text articles assessed for eligibility  
(n = 46)

Full-text articles excluded, according to inclusion and exclusion criteria  
(n = 37)

Full-text articles eligible  
(n = 9)

Duplication excluded  
(n = 3)

Studies included in qualitative synthesis  
(n = 6)
Appendix II  Table of evidence (1)


<table>
<thead>
<tr>
<th>Study design/ Country</th>
<th>Level of evidence</th>
<th>Patient characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of follow up</th>
<th>Outcome measure(s)</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT Single-blinded Hong Kong</td>
<td>1++</td>
<td>126 patients 65 in ONS 61 in control Both sex Age (I/C): 80.9/ 81.7 p=0.516 Nutritional status: Normally/ mildly undernourished</td>
<td>- ready-to-use liquid ONS - 18-24g protein and 500kcal per day - 240ml per can, twice per day - after surgery - administered within 3 days admitted to rehabilitation setting until discharge Mean days with ONS: 20.2</td>
<td>Without ONS -Discharge -28 days after discharge</td>
<td>Primary: (1) change in serum albumin level (2) BMI (3) MAC (4) FIM (5) TSF (6) EMS Secondary: (7) All complications (8) Infection episode (9) LOS (10)Mortality (11)AED attendance in 6 months</td>
<td>(1) Increase more in ONS (p&gt;0.05) (2) Decrease less in ONS (p=0.012) (3) Decrease less in ONS (p&gt;0.05) (4) Higher score in ONS (p&gt;0.05) (5) Decrease less in ONS (p&gt;0.05) (6) Higher score in ONS (p&gt;0.05) (7) (episodes: I/C) 30/60 (p&gt;0.05) (8) (I/C) 14/29 (p=0.019) (9) (days: I/C) 26.2/29.9 (p=0.04) (10)(I/C) 1/1 (p&gt;0.05) (11)episode: I/C 39/30 (p&gt;0.05)</td>
<td></td>
</tr>
</tbody>
</table>

Abbreviations: ONS= oral nutritional supplements; I= intervention group; C= control group; BMI= body mass index; MAC= mid-arm circumference; FIM= functional independence measure score; TSF= triceps skin fold; EMS= elderly mobility scale; LOS= length of stay; AED= accident and emergency department.
### Appendix II  Table of evidence (2)


<table>
<thead>
<tr>
<th>Study design/ Country</th>
<th>Level of evidence</th>
<th>Patient characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of follow up</th>
<th>Outcome measure(s)</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| RCT Non-Blinded Spain | 1++               | 60 patients            | - ready-to-use liquid ONS  
- 40g protein and 400kcal per day  
- 200ml per can, twice per day  
- before surgery  
- administered upon admission, **until discharge** | Without ONS | - 2 days after surgery  
- 7 days after surgery  
- on discharge | Primary:  
(1) Change in serum albumin  
(2) Change in BMI  
(3) TSF  
(4) MBC  
Secondary:  
(5) LOS  
(6) Complication  
(7) Time from surgery to start mobilization | (1) Decrease less in ONS (*p=0.045*)  
(2) No sig. difference (*p>0.05*)  
(3) No sign. difference (*p>0.05*)  
(4) No difference (*p>0.05*)  
(5) (days: I/C) 18.9±4.4/ 19.0±4.2 (*p>0.05*)  
(6) Higher rate in control (*p>0.05*)  
(7) (days: I/C) 8.2±4.2/ 7.5±3.5 (*p>0.05*)  
(8) higher protein intake, lesser risk of complication *p=0.003* |
|                       |                   | 30 in ONS group        | Mean days with ONS: 5.8±1.8 |           |                    |                    |             |
|                       |                   | 30 in control group    |                               |           |                    |                    |             |
|                       |                   | Both sex               |                               |           |                    |                    |             |
|                       |                   | Age (I/C):            |                               |           |                    |                    |             |
|                       |                   | 82.1/ 85.1            |                               |           |                    |                    |             |
|                       |                   | Nutritional status:   |                               |           |                    |                    |             |
|                       |                   | normally/ mildly      |                               |           |                    |                    |             |
|                       |                   | undernourished        |                               |           |                    |                    |             |

Abbreviations: ONS= oral nutritional supplements; I= intervention group; C= control group; MNA= Mini Nutritional Assessment; BMI= body mass index; TSF= triceps skin fold; MBC= mid-brachial circumference; LOS= length of stay.
Appendix II Table of evidence (3)


<table>
<thead>
<tr>
<th>Study design/ Country</th>
<th>Level of evidence</th>
<th>Patient characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of follow up</th>
<th>Outcome measure(s)</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| RCT Double-Blinded Spain | 1++ | 179 patients 85 in ONS group 86 in control group  
Both sex  
Age (I/C): 82.4/ 82.7  
Nutritional status: Normally/ mildly undernourished | - ready-to-use liquid ONS  
- 20g protein and 149 kcal per can  
- 200ml per can, once per day  
- before surgery  
- administered upon inclusion to test and 60 days in total | - placebo: 155 kcal per can | - 60 days  
- 180 days after fracture | Primary:  
(1) BI  
(2) MI  
(3) Days between surgery and mobilization  
Secondary:  
(4) Complication  
(5) LOS  
(6) Mortality  
Others:  
(7) Change in serum albumin level | (1) Average point lost (I/C): 14.6±21.2/ 15.8±20.6 (p>0.05)  
(2) Average point lost (I/C): 2/2 (p>0.05)  
(3) 12.4±24/ 12.8±18.7 (p>0.05)  
(4) No. of patients ≥ complication (I/C): 44/57 (p=0.04)  
(5) Days (I/C): 16.4±6.6/ 17.2±7.7 (p>0.05)  
(6) % (I/C): 12.5/9.9 (p>0.05)  
(7) g/l (I/C): 3.6/ 5.1 (p<0.05) |

Abbreviations: ONS= oral nutritional supplements; I= intervention group; C= control group; BI= Barthel index; MI= Mobility index
## Appendix II  Table of evidence (4)


<table>
<thead>
<tr>
<th>Study design/ Country</th>
<th>Level of evidence</th>
<th>Patient characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of follow up</th>
<th>Outcome measure(s)</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| RCT Non-blinded Spain | 1+                | 90 patients 30 in control 30 in protein 30 in energy protein Both sex Age (Ia/Ib/C): 83.7/ 83.1/84.6 Nutritional status: Normally/ mildly undernourished | (A) Protein - protein powder ONS - 36g protein, 152kcal per day - divided in 4 times a day  
(B) Energy protein - ready-to-use liquid ONS - 37.6g protein, 500kcal per day - 200ml per can, twice a day Started 48hrs after surgery Until discharge | Without ONS | - 2 days after surgery  
- 7 days after surgery  
- On discharge | Primary: (1) Serum albumin  
(2) Change of BMI  
(3) TSF  
(4) MBC  
Secondary: (5) LOS  
(6) Time from surgery to mobilization  
(7) Complication | (1) All has similar trend  
(2) All has similar trend  
(3) All has similar trend  
(4) All has similar trend  
(5) All are similar  
(6) All are similar  
(7) % (Ia/Ib/C): 50/57/50  
All p>0.05 |

Abbreviations: Ia= intervention group with protein powder; Ib= intervention group with energy protein; ONS= oral nutritional supplements; BMI= body mass index; TSF= triceps skin fold; MBC= mid-brachial circumference; LOS= length of stay.
Appendix II  Table of evidence (5)


<table>
<thead>
<tr>
<th>Study design/country</th>
<th>Level of evidence</th>
<th>Patient characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of follow up</th>
<th>Outcome measure(s)</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT Non-Blinded Australia</td>
<td>1+</td>
<td>44 patients 21 in intervention 23 in control</td>
<td>- 17.6-21.3g protein, 352.5-475kcal per day 235-237ml per can Once daily  - Started after surgery For 40 days</td>
<td>Without ONS (standard high protein diet provided by hospital)</td>
<td>- 40 days - 120 days</td>
<td>(1) Serum albumin (2) BMI (3) BI (4) MAC (5) LOS</td>
<td>(1) Increased (mean g/l: I/C): 2.8/ 1.4 (p&gt;0.05) (2) Decrease more in control (p&gt;0.05) (3) No significant change (p&gt;0.05) (4) No significant change (p&gt;0.05) (5) (I/C) (median days): 23.5/14 no statistical test result</td>
</tr>
</tbody>
</table>

Abbreviations: I= intervention group; C= control group; ONS= oral nutritional supplement; BMI= body mass index; BI= Barthel index; MAC= mid-arm circumference; LOS= length of stay.
### Appendix II Table of evidence (6)


<table>
<thead>
<tr>
<th>Study design/country</th>
<th>Level of evidence</th>
<th>Patient characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of follow up</th>
<th>Outcome measure(s)</th>
<th>Effect size</th>
</tr>
</thead>
</table>
| RCT Non-Blinded Sweden | 1- | 40 patients | - Ready-to-use liquid ONS  
- 20g protein per day  
- 200ml per can  
- Once a day  
- Since admitted to study to discharge | Without ONS | - 180 days  
- 360 days | (1) Weight  
(2) Serum albumin  
(3) ADL  
(4) HRQoL | (1) decreased kg (I/C): 1.26/2.39 (p>0.05)  
(2) Increase g/l (I/C): 6.5/4.7 (p<0.05)  
(3) Increase more in ONS group (p<0.05)  
(4) All decreased (p>0.05) (figures not shown) |

**Patient characteristics:**
- **Age (I/C):** 84.1/83.5  
- **Female**  
- **Nutritional status:** undernourished

**Intervention(s):**
- Ready-to-use liquid ONS  
- 20g protein per day  
- 200ml per can  
- Once a day  
- Since admitted to study to discharge

**Comparison:**
- Without ONS

**Length of follow up:**
- 180 days  
- 360 days

**Outcome measure(s):**
- (1) Weight  
- (2) Serum albumin  
- (3) ADL  
- (4) HRQoL

**Effect size:**
- (1) decreased kg (I/C): 1.26/2.39 (p>0.05)  
- (2) Increase g/l (I/C): 6.5/4.7 (p<0.05)  
- (3) Increase more in ONS group (p<0.05)  
- (4) All decreased (p>0.05) (figures not shown)

**Abbreviations:** I= intervention group; C= control group; ONS= oral nutritional supplement; ADL= activities of daily living; HRQoL= health-related quality of life.
Appendix III  Level of evidence (1)


### SECTION 1 INTERNAL VALIDITY

| 1.1 | The study addresses an appropriate and clearly focused question. | Yes |
| 1.2 | The assignment of subjects to treatment groups is randomised. | Yes Sealed opaque envelopes used. |
| 1.3 | An adequate concealment method is used. | Yes Blocks of 12, investigators do not know the patient's group assignment. |
| 1.4 | Subjects and investigators are kept 'blind' about treatment allocation. | Yes Data collectors do not know the group assignment. |
| 1.5 | The treatment and control groups are similar at the start of the trial. | Yes All are not significantly different, \( p > 0.05 \). |
| 1.6 | The only difference between groups is the treatment under investigation. | Yes |
| 1.7 | All relevant outcomes are measured in a standard, valid and reliable way. | Yes |
| 1.8 | What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? | 6.2% in intervention group 6.5% in control group |
| 1.9 | All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). | Yes |
| 1.10 | Where the study is carried out at more than one site, results are comparable for all sites | Does not apply |

### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

| 2.1 | How well was the study done to minimise bias? | 1++ |
| 2.2 | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | Yes. A high quality study. Meet all criteria. |
| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes |
| 2.4 | Notes. Researchers concluded that oral nutritional supplements favors patients BMI, lower the number of complication after surgery. But the second assessment moment (on discharge) was not a standardized date since the date of admission or operation. It varies for different patients. So the functional recovery assessed at this point may be affected. |
### Appendix III  Level of evidence (2)


#### SECTION 1 INTERNAL VALIDITY

| 1.1 | The study addresses an appropriate and clearly focused question. | Yes |
| 1.2 | The assignment of subjects to treatment groups is randomised. | Yes But poorly reported. |
| 1.3 | An adequate concealment method is used. | Yes. Researcher involved in randomization is not responsible for recruiting patients and collecting data. |
| 1.4 | Subjects and investigators are kept ‘blind’ about treatment allocation. | No. But it is difficult because it is not a placebo experiment. |
| 1.5 | The treatment and control groups are similar at the start of the trial. | Yes. All characteristics compared with \( p > 0.05 \) |
| 1.6 | The only difference between groups is the treatment under investigation. | Yes |
| 1.7 | All relevant outcomes are measured in a standard, valid and reliable way. | Yes |
| 1.8 | What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? | No drop out, no mortality |
| 1.9 | All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). | Yes |
| 1.10 | Where the study is carried out at more than one site, results are comparable for all sites | Does not apply |

#### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

| 2.1 | How well was the study done to minimise bias? | 1++ |
| 2.2 | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | Yes. Majority of the criteria meet. |
| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes |
| 2.4 | Notes. Researchers concluded that oral nutritional supplements are effective in recovering plasma protein after surgery. And patients with higher protein intakes had better outcomes. The result is applicable for patients who are normally nourished or mildly under-nourished. |  |

---

x
**Appendix III  Level of evidence (3)**


### SECTION 1 INTERNAL VALIDITY

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</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised.</td>
<td>Yes By computer in blocks of four.</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used.</td>
<td>Yes Sealed envelopes used.</td>
</tr>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
<td>Yes Both investigator and patients were “blind”.</td>
</tr>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
<td>Yes Mostly not significantly different, p&gt;0.05.</td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>5.9% in intervention group 5.8% in control group</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
<td>Yes</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites</td>
<td>Does not apply</td>
</tr>
</tbody>
</table>

### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

<table>
<thead>
<tr>
<th>2.1</th>
<th>How well was the study done to minimise bias?</th>
<th>1++</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?</td>
<td>Yes. Meet all criteria.</td>
</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
<td>Yes.</td>
</tr>
<tr>
<td>2.4</td>
<td><strong>Notes.</strong> Although the study failed to demonstrate ONS is effective in promoting patients’ functional recovery, the overall complication rate is lower in intervention group. Researchers pointed out that since a majority of patients are well nourished, the result may only applicable to this group of hip fracture patients.</td>
<td></td>
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</table>

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**xi**
### Appendix III  Level of evidence (4)


#### SECTION 1 INTERNAL VALIDITY

<table>
<thead>
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<th>1.1</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used.</td>
<td>Yes. Investigator responsible for randomization has no role in recruiting patients.</td>
</tr>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
<td>No. Unless a placebo test.</td>
</tr>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
<td>Yes. All characteristics are not significantly different, p&gt;0.1.</td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>10% in control 6.67% in intervention group.</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
<td>Yes</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites</td>
<td>Does not apply</td>
</tr>
</tbody>
</table>

#### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

<table>
<thead>
<tr>
<th>2.1</th>
<th>How well was the study done to minimise bias?</th>
<th>1+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?</td>
<td>Yes. Meet nearly all criteria. But Investigators who collected the data are not “blind” which may have chance to affect the result.</td>
</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
<td>Yes</td>
</tr>
<tr>
<td>2.4</td>
<td>Notes. Researchers failed to find out positive result of ONS on hip fracture patients. In my opinion, the methodology of the study employed may take some responsibility for that since the data collector is not “blind”, their performance may be subjected to the grouping. Researcher recommended the use of ONS should be individualized according to each patient.</td>
<td></td>
</tr>
</tbody>
</table>

xii
Appendix III  Level of evidence (5)


### SECTION 1 INTERNAL VALIDITY

<table>
<thead>
<tr>
<th></th>
<th>The study addresses an appropriate and clearly focused question.</th>
<th>No. Not clear.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised.</td>
<td>Yes. Sequence was derived from a random number table.</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used.</td>
<td>Yes. In a sealed card.</td>
</tr>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
<td>No. Cannot blind unless give placebo to control group.</td>
</tr>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
<td>Yes. All characteristics are not significantly different, p&gt;0.05.</td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>14.2% all from intervention group.</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
<td>Yes</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites</td>
<td>Does not apply.</td>
</tr>
</tbody>
</table>

### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

<table>
<thead>
<tr>
<th></th>
<th>How well was the study done to minimise bias?</th>
<th>1+</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?</td>
<td>Yes. Research question was unclearly stated.</td>
</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
<td>Yes.</td>
</tr>
<tr>
<td>2.4</td>
<td>Notes. And most of the study results were not statistically significant. Small sample size is a big problem. Researchers also pointed out that this was due to not all the patients who met the inclusion criteria were invited due to lack of manpower.</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix III  Level of evidence (6)


#### SECTION 1 INTERNAL VALIDITY

1.1 The study addresses an appropriate and clearly focused question. Yes

1.2 The assignment of subjects to treatment groups is randomised. Can’t say. Randomization is mentioned but not specific.

1.3 An adequate concealment method is used Can’t say. Did not mention.

1.4 Subjects and investigators are kept ‘blind’ about treatment allocation. No. Unless for a placebo test.

1.5 The treatment and control groups are similar at the start of the trial. Yes. All characteristics are not significantly different, p>0.05.

1.6 The only difference between groups is the treatment under investigation. Yes

1.7 All relevant outcomes are measured in a standard, valid and reliable way. Yes

1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? 15% in control group. 10% in intervention

1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). Yes

1.10 Where the study is carried out at more than one site, results are comparable for all sites. Yes

#### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1 How well was the study done to minimise bias? 1-

2.2 Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? Doubtful. Some of the research method was not specified.

2.3 Are the results of this study directly applicable to the patient group targeted by this guideline? Doubtful

2.4 Notes. Researchers reported that nutritional supplementation have positive effect on hip fracture patients in terms of ADL function (activities of daily living). They also pointed out that the type of hip fracture that patient suffered from may affect the quality of life of patients.
## Appendix IV  Mini Nutritional Assessment tool

### Nutritional support programme for Geriatric hip fracture patients

**Mini Nutritional Assessment tool**

<table>
<thead>
<tr>
<th><strong>Patient’s Gum label</strong></th>
<th><strong>Selected consumption markers for protein intake</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>* At least 1 serving daily products/days</td>
</tr>
<tr>
<td></td>
<td>* 2 or more servings of legumes or eggs per wk</td>
</tr>
<tr>
<td></td>
<td>* Meat, fish, poultry every day</td>
</tr>
<tr>
<td>a) 0 or 1 yes</td>
<td>= 0.0 points</td>
</tr>
<tr>
<td>b) 2 yes</td>
<td>= 5 points</td>
</tr>
<tr>
<td>c) 3 yes</td>
<td>= 10 points</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Total score:</strong></th>
<th></th>
<th><strong>Nutritional status:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>□ ≤ 17 Malnutrition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ 17-23.5 At risk of malnutrition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>□ ≥ 24 Normal</td>
</tr>
</tbody>
</table>

Assessed by: ___________ Rank: ___________ Date: ___________

Appendix V  Recruitment protocol
(Edited from: Myint, 2013; Botella-Carretero, 2010; Espaulella, 2000; Botella-Carretero, 2008; Cameron, 2011; Tidermark, 2004)

**Hip fracture?**
- Femoral head; or
- Neck of femur; or
- Trochanters; or
- Inter- or sub-trochanter region.

**Aged ≥ 65**

**Has any one or more of the following conditions?**
- Overweight (BMI ≥ 25);
- Acute or chronic renal failure;
- Severe heart failure;
- Respiratory failure;
- Any gastrointestinal condition that preclude patient from adequate oral nutrition intake.

**Informed consent**

**Included**

**Dietetic referral**
## Appendix VI  Comparison of patients’ characteristics

<table>
<thead>
<tr>
<th>Characteristics of patients</th>
<th>Reviewed studies (n=6)</th>
<th>Target setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>80-87 (average) (6)</td>
<td>65 or above</td>
</tr>
<tr>
<td>Sex</td>
<td>Both sex (4) Only female (2)</td>
<td>Female</td>
</tr>
<tr>
<td>Medical background</td>
<td>With chronic illness and/or operation done (6)</td>
<td>With chronic illness and/or operation done</td>
</tr>
<tr>
<td>Mobility level</td>
<td>Walk with walking aids or independently (6)</td>
<td>Walk with walking aids or independently</td>
</tr>
<tr>
<td>Level of dependency</td>
<td>Totally independent or partially dependent</td>
<td>Totally independent or partially dependent</td>
</tr>
<tr>
<td>Nutritional status</td>
<td>Normal to mildly malnourished (4) Under-nourished (2)</td>
<td>Normal to slightly under-nourished</td>
</tr>
</tbody>
</table>
### Appendix VII  Duration of implementation and evaluation

<table>
<thead>
<tr>
<th>Phase 1 Planning</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication with management level (DOM, WM, COS)</td>
<td>1 week</td>
</tr>
<tr>
<td>Communication with front staffs (Nurses, dietitian, O&amp;T surgeons)</td>
<td>1 week</td>
</tr>
<tr>
<td>Revision</td>
<td>1 week</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 2 Pilot</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pilot</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Evaluation</td>
<td>1 week</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 3 Implementation and Evaluation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Briefing session and training for frontline staff</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Full implementation</td>
<td>10 weeks</td>
</tr>
<tr>
<td>Program evaluation</td>
<td>4 weeks</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>22 weeks</td>
</tr>
</tbody>
</table>
Appendix VIII  Oral supplements available

<table>
<thead>
<tr>
<th>Oral supplements</th>
<th>Total protein (g)</th>
<th>ml/ can</th>
<th>%DV*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure®</td>
<td>9</td>
<td>237</td>
<td>18</td>
</tr>
<tr>
<td>Glucerna®</td>
<td>10</td>
<td>237</td>
<td>20</td>
</tr>
<tr>
<td>Compleat®</td>
<td>12.0</td>
<td>237</td>
<td>18</td>
</tr>
<tr>
<td>Ultracal®</td>
<td>12.8</td>
<td>237</td>
<td>NA^</td>
</tr>
<tr>
<td>Isocal®</td>
<td>8</td>
<td>237</td>
<td>NA^</td>
</tr>
<tr>
<td>Isosource®</td>
<td>16.9</td>
<td>250</td>
<td>NA^</td>
</tr>
<tr>
<td>Resource 2.0®</td>
<td>19.4</td>
<td>237</td>
<td>17</td>
</tr>
</tbody>
</table>

*% DV: Percentage daily values based on 2000 calories diet

^NA: information not provided by manufacturers
## Appendix IX  Staffs training cost

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
<th>Sub total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Train-the-trainer (1 NS/ APN)</td>
<td>$280*</td>
<td>$280</td>
</tr>
<tr>
<td>(preparation + briefing session: 1 hour)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frontline staff (half hour brief session)</td>
<td>$1357.5</td>
<td></td>
</tr>
<tr>
<td>(15 nursing + 15 HCA)</td>
<td>$611</td>
<td></td>
</tr>
<tr>
<td>(preparation + briefing session: 1 hour)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Training cost (pamphlet)</td>
<td>$75</td>
<td></td>
</tr>
<tr>
<td>Venue</td>
<td>Free</td>
<td>--</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2323.5</strong></td>
<td></td>
</tr>
</tbody>
</table>

* Hourly salary of NS/APN:
  Mean monthly salary = $49235 (Civil Service Bureau, 2013)
  Hourly salary = $280

Hourly salary of RN (general):
  Mean monthly salary = $31898
  Hourly salary = $181

Hourly salary of HCA:
  Mean monthly salary = $14348
  Hourly salary = $81.5
## Appendix X  Level of evidence and grades of recommendation

### Level of evidence (SIGN, 2004)

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1++</td>
<td>High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias</td>
</tr>
<tr>
<td>1+</td>
<td>Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias</td>
</tr>
<tr>
<td>1-</td>
<td>Meta-analyses, systematic reviews, or RCTs with a high risk of bias</td>
</tr>
<tr>
<td>2++</td>
<td>High quality systematic reviews of case control or cohort studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal</td>
</tr>
<tr>
<td>2+</td>
<td>Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal</td>
</tr>
<tr>
<td>2-</td>
<td>Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal</td>
</tr>
<tr>
<td>3</td>
<td>Non-analytic studies, eg case reports, case series</td>
</tr>
<tr>
<td>4</td>
<td>Expert opinion</td>
</tr>
</tbody>
</table>

### Grades of recommendation (SIGN, 2004)

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or A systematic review of RCTs or a body of evidence consisting principally of studies rated as 1+, directly applicable to the target population and demonstrating overall consistency of results.</td>
</tr>
<tr>
<td>B</td>
<td>A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+.</td>
</tr>
<tr>
<td>C</td>
<td>A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency results; or Extrapolated evidence from studies rated as 2++.</td>
</tr>
<tr>
<td>D</td>
<td>Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+.</td>
</tr>
</tbody>
</table>

RCT: randomized controlled trial
Appendix XI  Synthesis of recommendations

**Importance of innovation**  
**Recommendation 1.0**  
Nutritional support is important for elderly patients with hip fracture for better rehabilitation outcome.

Evidence:
- Nutritional status is an important prognostic factor associated with rehabilitation success of elderly patients with proximal hip fracture. (Hershkovitz, 2007). (2++)
- Older people with hip fracture are often malnourished at the time of the fracture. Surveys of dietary intake in people recovering from hip fracture in hospital have recorded suboptimal intakes (Avenell, 2010). (1++)
- Malnutrition in older adults admitted for rehabilitation has negative effect on functional recovery and quality of life after discharge to the community (Marshall, 2014). (2++)

**Patient screening**  
**Recommendation 2.0**  
Perform nutritional screening upon admission.

Evidence:
- Older people with hip fracture are often malnourished at the time of the fracture. Surveys of dietary intake in people recovering from hip fracture in hospital have recorded suboptimal intakes (Avenell, 2010). (1++)
- Malnutrition screening on hospital admission facilitated targeted nutritional intervention (Holyday, 2012). (1++)
- Unidentified malnutrition can heightens the risk of adverse complications for patient (Barker, 2011) (2+)
- Preoperative nutritional assessment may be useful in predicting patients at high surgical risk (Nicholson, 2012). (2+)

**Recommendation 2.1**  
Patients with the following conditions are not recommended for extra protein-rich supplements:
- Requiring tube feeding;
- Overweight (BMI $\geq 25$);
- Metastatic cancer;
- Acute or chronic renal failure;
- Hepatic insufficiency or cirrhosis;
- Severe heart failure (defined as New York Heart Association class III or IV);
- Respiratory failure;
- Any gastrointestinal condition that preclude patient from adequate oral nutrition intake.

Evidence:
- Patients who required tube feeding, BMI $\geq 25$, conditions with contraindication for high-protein diet were excluded (Myint, 2013). (1++)
- Exclusion criteria were acute and/or chronic renal failure, severe heart failure with class
III or IV of the New York Heart Association, respiratory failure, hepatic insufficiency or cirrhosis, and any gastrointestinal condition contraindicate for adequate nutritional intake (Botella-Carretero, 2010). (1++)

- Patients were excluded if they had diagnosed metastatic cancer, hepatic failure or chronic renal failure (Cameron, 2011). (1+)

**Intervention**

**Recommendation 3.0**

Oral supplements should be given soon after admission, before surgery if possible.

**Evidence:**

- Early nutritional intervention may improve rehabilitation outcome for elderly patients with hip fracture (Hershkovitz A). (2++)
- Nutritional status is known to worsen during hospital stay which is partly due to the poor recognition by the medical staff and adverse clinical routines (Norman K, 2008). (1+)

**Recommendation 3.1**

Patients eligible for the innovation will have one to two cans of the ready-to-use oral supplements everyday according to their nutritional needs after assessment from dietitian.

**Evidence:**

- It is recommended that the daily protein intake for human is 0.8g/kg according to body weight (WHO, 2007). (1++)
- Daily protein intake for orthopaedics patients should be higher at 1.0-1.2g/kg or more in order to restore muscle mass (Volkert, 2006). (1++)
- Patients were provided with one to two cans of ready-to-use oral nutritional supplements which contains 18-40g protein daily (Myint, 2014; Botella-Carretero, 2010; Espaulella, 2000; Botella-Carretero, 2008; Cameron, 2011; Tidermark, 2004). (1++, 1++, 1++, 1+, 1+, 1-)

**Recommendation 3.2**

Oral supplements for elderly patients with hip fracture should be given in short-term basis, in a cost-effective way during patients' hospitalization.

**Evidence:**

- The duration of oral protein take should ranged from 15 days to 12 months. (Cawood, 2012). (1++)
- Based on inadequate oral intake from the regular diet, oral nutritional supplement was recommended for a median period of 76 days (range 3-91) (Breedveld-Peters, 2012). (1+)
- Length of stay for hip fracture patients in the orthopaedics ward averages between 2 and 3 weeks, the overall hospital stay may average as much as 5 weeks (Parker, 1998). (2++)

**Evaluation**

**Recommendation 4.0**

Patients’ change of serum albumin level and post-operative complication rate in terms of
episode will be evaluated after patients’ discharge. The following conditions were included as episodes of complication:

- Prolonged immobilization;
- Delay in starting rehabilitation
- Infection (wound infection, respiratory infection, urinary tract infection);
- Delirium;
- Bed sore;
- Medical conditions (acute coronary syndrome, respiratory failure, severe anemia requiring blood transfusion, diarrhea, nausea, vomiting)

Evidence:

- Postsurgical complication were recorded, they included mechanical (prolonged immobilization, delay in starting rehabilitation), infections, and medical complications (wound infection, respiratory or urinary tract infections, acute coronary syndrome, respiratory failure, diarrhea, nausea and vomiting, severe anemia requiring blood transfusion) (Botella-Carretero, 2008; Botella-Carretero, 2010). (1+, 1++)
- The most common complications were delirium, urinary tract infection and bedsores (Espaulella, 2000). (1++)
Appendix XII  Communication flow

**Identification of Stakeholders**
- Management level: DOM, WMs, COS
- Frontline staffs: RN, EN, HCA, O&T surgeon, Dietitian
- Patients and their caregivers

**Formulation of Communication team**
- Consist of: 1 RN, 1 EN, 1 HCA, 1 NS, 1 APN, 1 WM, and 1 O&T Surgeon.

**Communication with Management level**
- MWs -> DOM -> COS

**Communication with Frontline healthcare providers**
- Dietitian & O&T Surgeon -> Peers (RNs, ENs, HCAs)

**Communication with Patients and their caregivers**
Appendix XIII Self-administered Questionnaire for satisfaction of frontline nurses

**Nutritional support programme for Geriatric hip fracture patients**

*Questionnaire for frontline staff (*to be filled in by RN/EN)*

<table>
<thead>
<tr>
<th>Name: (optional)</th>
<th>Ward:</th>
<th>Rank:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Date:**

<table>
<thead>
<tr>
<th>*please tick the appropriate boxes</th>
<th>Strongly agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The briefing session provides adequate information of the programme.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The workflow of the programme is clear.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The intervention is run smoothly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. I satisfy with the additional workload gained from the programme</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I am confident in manipulating the intervention.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Overall, I satisfy with programme.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other comments (optional):**


### Appendix XIV  Table of outcome measurements

**Nutritional support programme for Geriatric hip fracture patients**

*please put a tick in the appropriate box*

**Patient’s Gum label**

<table>
<thead>
<tr>
<th>Date of admission:</th>
<th>Date of discharge:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodyweight:</td>
<td>Height:</td>
</tr>
<tr>
<td>BMI:</td>
<td></td>
</tr>
</tbody>
</table>

**Type of fracture:**
- □ Left
- □ Right
- □ TOF
- □ NOF

**Oral supplement:**

**Mini Nutritional Assessment (MNA)**

**Score:**
- □ Malnutrition ($\leq 17$)
- □ At risk of malnutrition (17-23.5)
- □ Normal ($\geq 24$)

**Serum albumin level**

On admission (within 48 hours):  
On discharge:

**Complication (if any):**

- □ Delirium
- □ UTI
- □ Bedsore
- □ Sepsis
- □ Need for blood transfusion
- □ Death
- □ others: *please specify* ________

**Adverse effect(s) (if any):**

- □ GI conditions *please specify* ________
- □ Allergy reaction
- □ Others *please specify* ________