

Optimizing Nutrition For the Older Adult Following Hip Fracture

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Dr. Lappe has no conflicts.



Introduction

- Energy intake in older adults is smaller than that required and recommended. Has been referred to as "anorexia of aging."
Landi et al, Nutrients, 2016
- Contributing factors are poor teeth, decreased taste sensation, side effects of medications, lack of a principal caregiver, lack of money or transportation for obtaining food
- Weight loss and a reduction in muscle mass and fat tissue is observed in hip fracture patients. This is due to decreased intake (related to pain, being bedridden and immobile), and increased energy requirement secondary to the inflammatory state.
- The hypercatabolism may continue up to 4 months after the fracture



Definition of Malnutrition

- Malnutrition is defined as any nutritional imbalance.
- Overnutrition is described as consistently taking in more calories than needed.
- Undernutrition refers to lack of adequate calories, protein, and other nutrients needed for tissue maintenance and repair.
- Even overweight persons who have a major illness or injury are at risk of malnutrition.
- Thus, in the Consensus Statement, undernutrition in adults is synonymous with malnutrition.

Consensus Statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition. White et al, JPEN, 2012



Significance of the Problem

Between 25-60% of hip fracture patients are malnourished upon admission to hospitals. Breedveld-Peters, et al 2012

Both calorie and protein intake are significantly lower in older patients with hip fracture than those without fracture. Calorie and protein deficits contribute to fractures in 2 ways: 1) loss of strength and muscle mass that leads to falls and 2) loss of bone mass that reduces the resistance of bones to fracture.

Malnutrition is a risk factor for hip fracture and, in patients with hip fracture, it reduces ability to recover pre-fracture functional capacity.

Estimates are that 15% of women and 11% of men will have suffered a second hip fracture within 10 years after the first hip fracture.



Ommland et al, Bone, 2012

Low trauma hip fractures are osteoporotic hip fractures.

- The World Health Organization has indicated that the presence of a low trauma (fragility) fracture is criterion for diagnosis of osteoporosis. WHO Scientific Group on prevention and treatment of osteoporosis, 2000
- Low trauma is defined as trauma equal to or less than trauma sustained in a fall from a standing position.
- It is critical that hip fracture patients are diagnosed with osteoporosis and evaluated for treatment.
- However, studies show that only about 20% of hip fracture patients are given a diagnosis of osteoporosis at discharge.

Solomon et al: Am J Med 2003



Significance of the Problem

Malnutrition also increases health care spending and is



Significance of the Problem

During hospitalization, the nutritional status can deteriorate further due to:

- increased energy expenditure caused by metabolic stress and blood loss
- low dietary intake due to lack of appetite, nausea and psychological factors, and other factors
- interrupted feeding imposed to accommodate diagnostic tests and interventions to stabilize the patient.



Nutritional Assessment

- In 1996, the Joint Commission mandated that nutrition screening be done within 24 hours of admission to an acute care hospital.
- Many different approaches are used to meet this requirement.
- They vary from simple assessment of appetite and weight loss to more complex protocols.

White et al, JPEN, 2012



Diagnosis of Malnutrition

The identification of 2 or more of the following 6 characteristics is recommended for diagnosis:

- Insufficient energy intake
- Weight loss
- Loss of muscle mass
- Loss of subcutaneous fat
- Localized or generalized fluid accumulation that may mask weight loss
- Diminished functional status as measured by hand grip strength.

Consensus Statement: Academy of Nutrition and Dietetics and American Society for Parenteral and Enteral Nutrition: White et al, JPEN; 2012



Mini Nutritional Assessment
MNA[®]

LAST NAME: _____ FIRST NAME: _____

AGE: _____ HEIGHT: _____ WEIGHT: _____

1. Appetite (How many meals did you eat in the past 7 days?)

2. Weight loss (How much weight did you lose in the past 3 months?)

3. Mobility (How many times did you get up and walk in the past 7 days?)

4. Psychological stress or acute disease (How many times did you suffer from psychological stress or acute disease in the past 3 months?)

5. Neuro-psychological problems (How many times did you suffer from neuro-psychological problems in the past 3 months?)

6. BMI or calf circumference (What is your BMI or calf circumference?)

7. Total score (Total score)

8. Nutritional status (Nutritional status)

9. Risk of malnutrition (Risk of malnutrition)

10. Malnourished (Malnourished)

11. At risk of malnutrition (At risk of malnutrition)

12. Normal (Normal)

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- A. Has food intake declined over the past 3 months due to loss of appetite, digestive problems, chewing or swallowing difficulties?
- B. Weight loss during the last 3 months?
- C. Mobility
- D. Has suffered psychological stress or acute disease in the past 3 months?
- E. Neuro-psychological problems
- F. BMI or calf circumference.
- Scoring:
12-14 normal
8-11 at risk of malnutrition
0-7 malnourished



Nutrition Assessment of Malnourished Patients

Those who are found to be malnourished or at risk should have further evaluation which should be repeated regularly since the acuity level of the patient's nutritional status may change during the course of care.

1. History and clinical diagnosis
2. Physical exam/clinical signs
3. Anthropometric data (Weight should be measured not asked from the patient; get height or estimated height by using validated algorithms www.rxkinetics.com/height_estimate.html)
4. Laboratory data: serum albumin, prealbumin, C reactive protein, WBC, glucose levels
5. Food/nutrient intake
6. Functional assessment



Key points

- Get a dietician consult early.
- In many hospitals the screening assessment score is entered into the EMR, and the dieticians generate a list of patients who are malnourished or at risk.
- The dietician and other team members then follow up with further assessment and recommendations as appropriate.
- Be sure to document a diagnosis of malnutrition so that appropriate reimbursement can be made.



Fracture Healing

- Complex processes of cell and tissue proliferation and differentiation
- Includes many "players": growth factors, inflammatory cytokines, antioxidants, osteoclasts, osteoblasts, hormones, amino acids and countless nutrients.



The Nutritional Demands of Healing

Calories: the healing process requires a great deal of energy, generally supplied through calories in food. Estimates are that three times the usual caloric intake may be needed during fracture healing.

Protein: bone is made up of a matrix of living protein (hydroxyproline) upon which mineral crystals are embedded. When a fracture occurs, the body needs to gather protein building blocks to synthesize a new protein matrix for the fractured area.

Calcium:

This is the major pathogenic mechanism of osteoporosis.



The Nutritional Demands of Healing



Vitamin D, Muscle Strength, and Falls

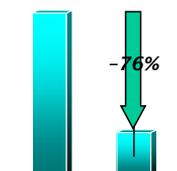
- Skeletal muscles have vitamin D receptors and may require vitamin D for maximal function.
- Vitamin D deficiency causes muscle weakness.



VITAMIN D & RISK OF FALLING

- 445 men & women
- age: 65 +
- DB-RCT
 - placebo
 - Ca 500 mg + Vit D 700 IU
- 3 yr duration
- baseline 25(OH)D –
 - women: 26 ng/mL
 - men: 33 ng/mL

Sedentary Women – per protocol



Bischoff et al., 2006; Arch Int Med 166:424-430

Calcium and Vitamin D Recommended Intakes

Age group	Calcium mg/d	Vitamin D ₃ IU/d
1 - 3 years old	700	400
4 - 8 years old	1,000	600
9 - 13 years old	1,300	600
14 - 18 years old	1,300	600
19 - 30 years old	1,000	600
31 - 50 years old	1,000	600
51 - 70 years old males	1,000	600
51 - 70 year old females	1,200	600
71+ years old	1,200	800

Institute of Medicine (National Academy of Science) 2010



Other Recommendations for Vitamin D Intake

- National Osteoporosis Foundation: ≥ 50 yrs 800-1000 IU/d. Cosman et al. Osteoporos Int, 2014
- Endocrine Society guidelines: ≥ 65 yrs 800 IU/d. Holick et al. J Clin Endocrinol Metab, 2011
- American Geriatrics Society recommendations: 1000 IU/d. Am Geriatr Soc Workgroup. J Am Geriatr Soc, 2014
- Institute of Medicine: 4 through 70 years 600 IU/d; 71+ yrs, 800 IU/d



Calcium Intake (mg/d) of US Population NHANES 2009-2010

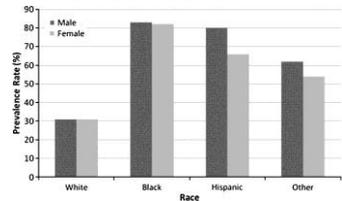
Age groups (yrs)	Women	Men
20-39	947	1210
40-59	882	1118
60+ **	842	966

** Significantly different than other age groups combined



Prevalence of Vitamin D Deficiency: NHANES 2005-2006

Vitamin D deficiency = 25(OH)D ≤ 20 ng/mL (50 nmol/L).



Forrest et al. Nutr Res, 2011



Measurement of 25(OH)D

- Serum 25 hydroxyvitamin D [25(OH)D] – functional indicator of vitamin D
- It is the only way to evaluate vitamin D status.
- Many things affect how well vitamin D intake translates to higher serum 25(OH)D: for example, obesity, genetic polymorphisms, variability in absorption.
- In addition, conversion in the skin from sunlight exposure varies in how much 25(OH)D increases: age, darkness of skin, use of sunscreen, latitude and season, amount of skin exposure.
- The Endocrine Society recommends ≥ 30 ng/mL as the level needed to maintain bone health.
- Due to wide variation in assays, it is recommended that clinicians target 40 ng/mL for their patients. Binkley et al. Journal of Clinical Densitometry, 2009.



Protein

- Animal studies show that fractures in protein-sufficient animals heal faster than fractures in protein-deficient animals. Human data are minimal.
- Protein is associated inversely with risk of hip fracture. For example, in the Framingham study with 946 adults, mean age 75, those in the 3 highest quartiles of protein intake had a 37% lower risk of hip fracture than those in the lowest quartile. Misra et al, Osteoporos Int, 2012
- Protein intake is also inversely associated with loss of lean body mass. In 3075 men and women between and 70 and 79 yrs, those in the highest quintile of protein intake lost 40% less lean body mass and appendicular lean mass than did those in the lowest quintile of protein intake $P < 0.01$. Houston et al, AJCN 2008
- However, the amount of protein required is still under debate.



Recommended Protein Intake

- The DRI (Dietary Reference **Intake**) is 0.8 grams of **protein** per kilogram of body weight, or 0.36 grams per pound. This amounts to: 56 grams per day for the average sedentary man. 46 grams per day for the average sedentary woman.
- Experts at a Protein Summit in 2013 concluded that 1.0 -1.5 grams per kilogram would be beneficial for metabolic functions and for prevention of sarcopenia, the muscle wasting associated with aging. Rodriguez, AJCN,



American Academy of Orthopedic Surgeons Evidence-based Guideline on Management of Hip Fracture in the Elderly 2015

Recommendation for Nutrition:

- Moderate evidence supports that postoperative nutritional supplementation reduces mortality and improves nutritional status in hip fracture patients

Strength of Recommendation: Moderate (three out of four stars)

https://www.aaos.org/cc_files/aaosorg/research/guidelines/hipfxguideline.pdf



Using Dietetic Assistants (DA) to Improve the Outcomes of Hip Fracture: a Randomized Trial

- **Objective:** to examine how improved attention to nutritional status and dietary intake, achieved through the employment of dietetic assistants (DAs), will affect postoperative clinical outcomes among older women with hip fracture.
- 333 women >65 yrs, with and without cognitive impairment, admitted with acute nonpathological hip fracture over the course of three years. 302 participants completed the four-month follow-up.
- Subjects were randomized either to the conventional nurse- and dietitian-led care (which included the routine provision of oral nutritional supplements to all patients) or to the additional personal attention of the DAs.
- Assessments were based on the protocol of the Standardized Audit of Hip Fractures in Europe (SAHFE) (Parker et al, Hip Int, 1998) and performed on admission, at discharge from the acute unit and at 4-month follow-up.



Duncan et al, Age and Ageing, 2006

DA Responsibilities

- checking personal and cultural food preferences
- coordinating appropriate meal orders with catering staff
- ordering nutritional supplements when necessary
- provision of appropriate feeding aids
- assisting with food choice, portion size and positioning at mealtimes
- sitting with, encouraging and feeding the frailest patients at mealtimes
- collecting information to aid nutritional assessment by the dietitian.



Results

DA-supported participants were less likely to die in the acute unit (4.1 versus 10.1%, $P = 0.048$). This effect was still apparent at 4 month follow-up (13.1 versus 22.9%, $P = 0.036$).

DA-supported subjects had:

- significantly better mean daily energy intake (1,105 kcal versus 756 kcal/24 h, $P < 0.001$),
- significantly smaller reduction in mid-arm circumference during their inpatient stay (0.39 cm, $P = 0.002$) and
- non-significantly favorable results for other anthropometric and laboratory measurements.



Duncan et al, Age and Ageing, 2006

Nutritional Supplementation of Elderly Hip Fracture Patients: A Randomized, Controlled Trial

- Objective: to determine whether a nutritional supplement may (i) help elderly patients return to pre-fracture functional levels 6 months post-fracture and (ii) decrease fracture-related complications and mortality.
- double-blind, randomized, placebo-controlled clinical trial
- 171 patients, aged 70 and older
- nutritional supplement containing 20 g of protein and 800 mg of calcium or placebo for 60 days
- Determined functional levels by the Barthel index, the mobility index and by the use of walking aids. Assessments done during hospitalization and at 2 and 6 months post-fracture

Espauilella et al, Age & Aging, 2000



Results

The intervention group suffered fewer in-hospital and total complications (55% vs 70%, $p=0.04$)

No differences were found in mortality rate or return to functioning.
Espauella et al, Age & Aging, 2000



Compliance with Oral Nutritional Supplements

A systematic review of 46 studies ($n = 4328$) found that compliance with oral nutritional supplements (ONS) was 78% (67% hospital, 81% community).

Compliance was positively associated with higher energy-density ONS.
Hubbard et al, Clin Nutr, 2012



Summary

Many older adults ingest less than recommended levels of nutrient intake, which increases their risk of osteoporotic hip fractures.

Between 25-60% of hip fracture patients are malnourished upon admission to hospitals, and the nutritional status of many of those will deteriorate further during convalescence.

Several short, validated tools are available for determining presence and risk of malnutrition.

The major nutrients needed for bone health and fracture healing are calories, calcium, vitamin D, and protein although many micronutrients are important.

Studies consistently show that nutritional interventions decrease complications of hip fracture.



Conclusion

We have an amazing opportunity to prevent osteoporotic hip fractures and to decrease the morbidity and mortality associated with them.

It is critical that we assess nutritional status of our older adult patients and take action for those who are malnourished or at risk.

It is also critical that information about nutritional status is included in care transitions between clinical sites and between those sites and home.

