# Malnutrition among Older Adults in the Emergency Department

**Objectives:** We estimate the prevalence of malnutrition among older patients presenting to an emergency department (ED) in the southeastern United States and identify subgroups at increased risk.

**Methods:** We conducted a cross-sectional study with random time block sampling of cognitively intact patients aged 65 years and older. Nutrition was assessed using the Mini Nutritional Assessment Short-Form (0-14 scale) with malnutrition defined as a score of 7 or less and at-risk for malnutrition defined as a score of 8-11. The presence of depressive symptoms was defined as a Center for Epidemiological Studies Depression-10 score of 4 or more (0-10 scale).

**Results:** Among 138 older adults, 16% (95% Confidence Interval [CI], 10%-22%) were malnourished and 60% (95% CI, 52%-69%) were either malnourished or at-risk for malnutrition. Seventeen of the 22 malnourished patients (77%) denied previously being diagnosed with malnutrition. The prevalence of malnutrition was not appreciably different between males and females, across levels of patient education, or between those living in urban and rural areas. However, the prevalence of malnutrition was higher among patients with depressive symptoms 52%, those residing in assisted living 50%, those with difficulty eating 38%, and those reporting difficulty buying groceries 33%.

**Conclusion:** Among a random sample of cognitively intact older ED patients, more than half were malnourished or at-risk for malnutrition, and the majority of malnourished patients had not previously been diagnosed. Higher rates of malnutrition among those with depression, difficulty eating, and difficulty buying groceries suggest the need for multifaceted interventions.

**INTRODUCTION**

Malnutrition is a common but under-diagnosed condition in older adults that is associated with physical and cognitive decline,[1,2] decreased quality of life,[3] and mortality.[4] Pooled estimates report the prevalence of malnutrition among community-dwelling older adults of 6% and among hospitalized older adults of 39%.[5] In developed countries, treatment of malnutrition is relatively inexpensive and effective: energy and protein supplementation using commercial 'sip feeds' results in both weight gain and reduced mortality.[6] Despite the existence of brief, accurate instruments to screen for malnutrition, implementation of screening protocols across health care settings is inconsistent. Failure to identify malnutrition is a major obstacle to ensuring that malnourished older adults receive optimal nutritional support.[7-9]

Older adults make more than 20 million visits to United States emergency departments (EDs) each year. EDs provide an important setting for screening for chronic under-diagnosed medical problems because they provide access to patients who do not receive routine medical care.[10,11] The value of using the ED as a setting for screening for chronic conditions has been demonstrated for HIV, domestic violence, and substance abuse.[12-15] Although there is growing awareness of the potential value of the ED to screen for chronic conditions in older adults,[16] including non-medical conditions,[17] malnutrition has not been identified as one of these conditions. In order to determine the potential impact of an ED-based screening protocol for malnutrition in older adults, a better understanding of the epidemiology of malnutrition among older ED patients is needed. We sought to estimate the prevalence of malnutrition and risk for malnutrition among older adults presenting to a single ED and identify subgroups at increased risk.

**METHODS**

**Study Design**

This was a cross-sectional study of ED patients aged 65 years and older. Patient recruitment and enrollment occurred over a period of 8 weeks in June and July 2013 during 32 four-hour periods randomly selected as follows: first, four distinct days (including weekends) were selected within each week; second, the start time for each period was selected with equal probability from 9 a.m., 1 p.m., or 5 p.m. The study was approved by the study site Institutional Review Board and each patient provided written informed consent.

**Setting**

The study was conducted in a single academic ED in the southeast United States serving a racially and socioeconomically diverse population of older adults. In the calendar year of 2013, the ED had approximately 70,080 visits with 10,464 visits (14.9%) by patients aged 65 years and older.

**Selection of Participants**

Patients were eligible if aged 65 years or older, not cognitively impaired, not living in a nursing home or skilled nursing facility, and not experiencing an immediate life-threatening illness or injury as determined by an Emergency Severity Index score of 1[18] or as judged by the treating emergency provider. Cognitive impairment was defined as a Six Item Screener score of 3 or less.[19] Patients who were still in the ED but had a hospital bed assigned or had received discharge papers were excluded so that the study did not interfere with the flow of patients out of the department. Research assistants (RAs) assessed each patient's eligibility. When the number of potentially eligible ED patients exceeded the number of available research assistants, the list of potentially eligible patients was randomized using computer generated

random numbers to define the order for screening patients. Among eligible, consenting patients, study data were collected via an in-person interview by the RA.

Prior to collecting data, RAs were instructed in how to determine which patients were eligible for screening and how to code possible responses to screening and interview questions. RAs then observed an interview conducted by an emergency physician with experience in prospective ED research. Weekly meetings were held to review the screening and enrollment process and address RA questions.


**Data Collection and Measures**

Interviews lasted approximately 20 minutes and assessed sociodemographic characteristics, nutritional status, and medical history. Nutritional status was measured using the Mini-Nutritional Assessment Short-Form (MNA-SF), a validated 6-item tool which combines body mass index (BMI) and patient responses to factors previously linked to malnutrition: weight loss, decline in food intake, recent psychological stress or acute disease, mobility, and neuropsychological disorders.[20] The results of the MNA-SF are summed to produce a score from 0-14 with malnutrition defined as a score of ≤7 and at-risk for malnutrition defined as a score of 8-11.[20] Consistent with the instructions for using the MNA-SF, direct measurements of height and weight were used to measure body mass index (BMI) except in participants who were unable to stand, for whom calf-circumference was measured. In addition to sociodemographic groupings, subgroups of patients assessed for increased risk for malnutrition were identified based on a review of literature on malnutrition and included patients with difficulty eating,[21,22] difficulty buying groceries,[23] depression,[22,24] lack of transportation,[22,25] and difficulty walking.[22,24] In order to determine whether malnutrition was recognized by the emergency provider or emergency nurse, two authors independently reviewed physician and nursing records for all patients with a MNA-SF score of ≤7. These reviews searched explicitly for a positive

response to the single-item question regarding malnutrition (a standard prompt in the triage

nursing note) or any other information contained elsewhere in the record indicating the diagnosis

or provision of treatment for malnutrition. Prior to conducting the search, the following

descriptors or variants thereof were considered recognition of malnutrition: malnutrition;

cachexia; wasting; failure to thrive; weight loss; inadequate food intake; or the need for

nutritional supplementation, improved diet, nutritional counseling, or food stamps.  For 10

randomly selected patients, the time to administer the MNA-SF was measured. This

measurement included the time to administer the five verbal questions as well as measure BMI

or calf-circumference.

**Data Analysis**

Data are reported as proportions with 95% confidence intervals. The estimated prevalences of a)

malnutrition and b) either malnutrition or at-risk for malnutrition are reported for the entire

sample and among subgroups of participants stratified by sociodemographic characteristics and

comorbidities. Prevalences are compared across subgroups in a descriptive manner without

formal statistical testing. Consistent with this, observed differences that appear to be clinically

important are identified and presented as generating rather than confirming hypotheses.

Based on the observation of a notably higher rate of malnutrition in patients with

depression, a post-hoc sensitivity analysis was conducted to assess for an association between

depression and malnutrition using a definition of malnutrition that did not include information

about depression. To do this, a new MNA-SF summary score ranging from 0-12 was calculated

for all patients excluding the question assessing neuropsychological problems, which yields 2

points for patients without dementia or depression. This new score was dichotomized by defining

malnutrition as a score ≤5, and the prevalence of malnutrition using this revised definition is reported for patients with and without depression.

**RESULTS**

A total of 353 patients aged 65 years or older presented to the ED during the 128 hours of enrollment. Of these patients, 169 were eligible, 141 were enrolled, and 138 completed the interview and were included in subsequent analyses (Figure). The most common reason patients were not screened was because they were critically ill (n=70). The majority of participants were white (69%) or female (57%) and almost all had a primary provider (95%) and lived in a private residence (94%).

Malnutrition as defined by an MNA-SF score ≤7 was identified in 22 patients, corresponding to an overall prevalence of 15.8% (95% confidence interval [CI], 9.7% to 21.9%). Of these 22 patients, only 5 (23%) had been previously diagnosed with malnutrition. The combined prevalence of malnutrition or at-risk for malnutrition was 60.4% (95% CI, 52.2% to 68.6%) and over 50% across all subgroups assessed in this study. The prevalence of malnutrition was not substantially different for females vs. males, across levels of educational attainment, or for those aged 65-74 years vs. 75 years and older (Table).

The prevalence of malnutrition was notably higher in the following patient subgroups: those residing in assisted living; those reporting difficulty buying groceries sometimes or often in the past year; those with symptoms of depression; and those with difficulty eating. Since the MNA-SF includes an item measuring depression, we conducted a sensitivity analysis excluding that item, and results remained robust. In that analysis, 40.0% (95% CI, 14.2% to 40.2%) of individuals with symptoms of depression were rated as malnourished vs. only 5.3% (95% CI,

2.5% to 11.1%) of individuals without symptoms of depression. Of the 16 patients reporting difficulty eating, 6 reported denture problems, 3 reported dental pain, 3 reported difficulty swallowing, and 4 reported some other problem. Of those participants who were discharged home from the ED (i.e., not hospitalized), 6.0% (95% CI, 0.3% to 11.7%) were malnourished and 56% were either malnourished or at-risk for malnutrition. Among the 22 patients with malnutrition, no information was identified by either reviewer in either the physician or nurse records to indicate recognition of the problem of malnutrition. Additionally, for 16 of these 22 patients, the single-item assessment of malnutrition was completed by the triage nurse and indicated no problem with malnutrition. For the 6 remaining patients, the singe-item assessment was not completed. Among a random sample of 10 participants, the total time to administer the MNA-SF ranged from 3 to 5 minutes.

**LIMITATIONS**

This study has several limitations. The sample size prevents us from providing precise estimates of the prevalence of malnutrition among less prevalent patient subgroups, such as residents of assisted living facilities. We excluded older adults who were critically ill or had moderate or severe cognitive impairment. These groups comprise important subgroups of older patient receiving care in the ED and are likely to be at high risk for malnutrition.

Malnutrition is a complex problem resulting from biological, social, and psychological factors not all of which were assessed in this study. Anticholinergics and several other commonly prescribed medications including metronidazole, sulfamethoxazole, and carbidopa-levadopa either increase constipation or suppress appetite and can contribute to decreased food intake and malnutrition.[26,27] Modifying medications regimens might be a valuable addition to a

program to improve nutritional status among older adults. While eating disorders generally manifest during adolescence, an estimated 4% of older women suffer from eating disorders.[28,29] Identification of an eating disorder might be an essential step in improving nutritional health in some older adults. Finally, our sample was collected from a single ED in the southeastern US. Although the patient population cared for in this ED is racially and socioeconomically diverse and similar to that of the general US population, sociodemographics of older adults receiving emergency care in other parts of the US vary considerably, limiting the generalizability of these findings.

**DISCUSSION**

Based on a random sample, we estimated a prevalence of malnutrition among cognitively intact, non-critically ill older adults presenting to a single academic ED over an 8 week period to be between 10% and 22%. Most of these malnourished patients had not previously been diagnosed, and the single-item assessment of nutrition currently embedded in the triage nurse assessment failed to identify any of these cases. Our point estimate of the prevalence of malnutrition among older adults discharged from the ED (6%) is similar to that from community samples (5.8%);[5] our estimate among admitted patients (25.4%) is lower than prior estimates from hospitalized patients (38.7%).[5] We assessed malnutrition using the MNA-SF, which we found could be rapidly administered in the ED. The MNA-SF has the additional advantages of closely agreeing with more comprehensive measures but not relying solely on BMI, which has been shown to be an unreliable measure of malnutrition among older adults.[30]

Our observed trends suggest possible avenues for intervention that could be investigated in subsequent research. Higher rates of malnutrition among those reporting difficulty buying

groceries suggest the value of connecting older ED patients with Supplemental Nutrition Assistance Programs (previously known as the Food Stamps Program), which are often available for, but under-utilized by, older adults.[31] While the study methods preclude us from inferring the presence or direction of a causal relationship between malnutrition and depression, the substantially higher observed rates of malnutrition among patients with depressive symptoms, even after removing depression from the malnutrition score, suggests that interventions targeting both malnutrition and depression may be appropriate in jointly affected individuals. More than a third of patients reporting difficulty eating were malnourished. Of the problems reported, improper fit of dentures and dental pain were the most common. The relationship between dental problems and malnutrition among older adults have previously been described,[32,33] and improved access to or receipt of dental care might improve nutritional status among these individuals.

In 2004, unplanned rehospitalizations cost Medicare approximately $17.4 billion, and these costs have risen further over the past decade.[34] Implementation of oral nutritional supplementation is inexpensive and may result in overall health care cost saving due to its capacity to decrease readmission rates and reduce complications in recovery.[35,36] Thus, a program to screen for and intervene on malnutrition in older adults has the potential to both improve health and reduce health care costs. Because it provides access to a vulnerable population of older individuals, the ED would likely be a particularly valuable environment in which to institute such a program.


**CONCLUSION**

We observed a high prevalence of undiagnosed malnutrition among older patients presenting to an ED that was not detected by an existing malnutrition assessment. Our findings suggest that

improved ED-based screening for malnutrition coupled with interventions may provide an

opportunity for improving health among older adults.

**Figure.** Flow diagram of eligibility and enrollment in the emergency department.

```
┌─────────────────────┐
│   Age ≥65 years     │
│    (n = 353)        │
└─────────────────────┘
         │
         │      ┌──────────────────────────────────────────┐
         │      │ Not screened (n = 145)                   │
         ├─────▶│ • Critically ill (n = 70)                │
         │      │ • Discharged (n = 21)                    │
         │      │ • Refused  screener (n = 18)             │
         │      │ • Admitted (n = 14)                      │
         │      │ • Other (n = 22)                         │
         │      │ Ineligible: (n=39)*                      │
         │      │ • Could not communicate (n = 25)         │
         │      │ • Cognitive impairment  (n = 20)         │
         │      └──────────────────────────────────────────┘
         ▼
┌─────────────────────┐
│     Eligible        │
│    (n = 169)        │
└─────────────────────┘
         │
         │      ┌──────────────────────────────────────────┐
         │      │ Declined to participate (n = 28)         │
         ├─────▶│ • Too ill, weak, or tired (n = 8)        │
         │      │ • Would take too much time (n = 3)       │
         │      │ • Other or no reason given (n = 17)      │
         │      └──────────────────────────────────────────┘
         ▼
┌─────────────────────┐
│     Enrolled        │
│    (n = 141)        │
└─────────────────────┘
         │
         │      ┌──────────────────────────────────────────┐
         │      │ Excluded (n = 3)                         │
         ├─────▶│ • Incomplete Interview (n = 2)           │
         │      │ • Skilled Nursing Facility (n = 1)       │
         │      └──────────────────────────────────────────┘
         ▼
┌─────────────────────┐
│   Study sample      │
│    (n = 138)        │
└─────────────────────┘
```

* Not mutually exclusive

**Table.** Estimated prevalences of a) malnutrition and b) malnutrition or at-risk for malnutrition among patient subgroups.

| Characteristic | N | %, 95% CI | |
|---|---|---|---|
| | | Malnourished (N=22) | Malnourished or At-Risk (N=116) |
| All | 138 | 15.8 (9.7,21.9) | 60.4 (52.2,68.6) |
| Sex | | | |
| Female | 77 | 18.0 (9.5,26.5) | 62.9 (52.1,73.7) |
| Male | 61 | 13.1 (4.6,21.6) | 54.1 (41.6,66.6) |
| Age | | | |
| 65-74 | 86 | 17.2 (9.3,25.1) | 63.2 (53.0,73.4) |
| ≥75 | 52 | 13.5 (4.2,22.8) | 52.0 (25.3,51.7) |
| Education | | | |
| Not college graduate* | 90 | 17.8 (9.9,25.7) | 62.2 (52.2,72.2) |
| College graduate | 48 | 12.5 (3.1,21.9) | 56.3 (42.3,70.3) |
| Race | | | |
| White | 95 | 17.1 (9.6,24.6) | 55.6 (45.6,65.6) |
| Black | 36 | 8.3 (0.0,17.3) | 69.4 (54.4,84.5) |
| Other | 7 | 16.7 (0.0,46.5) | 50.0 (13.0,87.0) |
| Living Arrangement | | | |
| Private Residence | 131 | 13.9 (8.0,19.9) | 58.5 (50.0,67.0) |
| Assisted Living Facility | 7 | 50.0 (15.4,84.7) | 75.0 (45.0, 100) |
| Population Density | | | |
| Rural | 90 | 14.6 (7.3,21.9) | 61.8 (51.8,71.8) |
| Urban | 48 | 16.7 (6.2,27.3) | 58.4 (44.4,72.3) |
| Disposition | | | |
| Admitted | 72 | 25.4 (15.4,35.5) | 64.8 (53.8,75.8) |
| Discharged | 66 | 6.0 (0.3,11.7) | 56.0 (44.0,68.0) |
| Difficulty buying groceries | | | |
| Yes | 12 | 33.3 (6.6,60.0) | 66.6 (39.9,93.3) |
| No | 125 | 14.4 (8.3,20.6) | 59.2 (50.6,67.8) |
| Lack of transportation | | | |
| Yes | 17 | 15.8 (12.6,58.0) | 60.4 (37.2,83.7) |
| No | 122 | 13.1 (7.1,19.1) | 59.0 (50.3,67.7) |
| Difficulty walking | | | |
| Yes | 66 | 27.2 (16.9,38.5) | 66.6 (55.2,78.0) |
| No | 73 | 5.5 (0.3,10.7) | 54.8 (43.4,66.2) |
| Depression | | | |
| Yes | 25 | 52.0 (32.4,71.6) | 84.0 (69.6,98.4) |
| No | 113 | 8.0 (3.0,13.0) | 54.9 (45.7,64.1) |
| Difficulty Eating | | | |
| Yes | 16 | 37.5 (13.8,61.2) | 75.0 (53.8,96.2) |
| No | 123 | 13.1 (7.1,19.1) | 58.2 (49.5,66.9) |

*includes individuals with some college

## REFERENCES

1.      Salvi F, Giorgi R, Grilli A, et al. Mini Nutritional Assessment (short form) and functional decline in older patients admitted to an acute medical ward. Aging Clin Exp Res 2008;20:322-8.

2.      Cereda E, Valzolgher L, Pedrolli C. Mini nutritional assessment is a good predictor of functional status in institutionalised elderly at risk of malnutrition. Clin Nutr 2008;27:700-5.

3.      Crogan NL, Pasvogel A. The influence of protein-calorie malnutrition on quality of life in nursing homes. The journals of gerontology Series A, Biological sciences and medical sciences 2003;58:159-64.

4.      Correia MI, Waitzberg DL. The impact of malnutrition on morbidity, mortality, length of hospital stay and costs evaluated through a multivariate model analysis. Clin Nutr 2003;22:235-9.

5.      Kaiser MJ, Bauer JM, Ramsch C, et al. Frequency of malnutrition in older adults: a multinational perspective using the mini nutritional assessment. J Am Geriatr Soc 2010;58:1734-8.

6.      Milne AC, Potter J, Vivanti A, Avenell A. Protein and energy supplementation in elderly people at risk from malnutrition. The Cochrane database of systematic reviews 2009:CD003288.

7.      Wilson MM, Vaswani S, Liu D, Morley JE, Miller DK. Prevalence and causes of undernutrition in medical outpatients. The American journal of medicine 1998;104:56-63.

8.      Guigoz Y, Vellas BJ. [Malnutrition in the elderly: the Mini Nutritional Assessment (MNA)]. Therapeutische Umschau Revue therapeutique 1997;54:345-50.

9.      Singh H, Watt K, Veitch R, Cantor M, Duerksen DR. Malnutrition is prevalent in hospitalized medical patients: are housestaff identifying the malnourished patient? Nutrition 2006;22:350-4.

10.     Zibulewsky J. The Emergency Medical Treatment and Active Labor Act (EMTALA): what it is and what it means for physicians. Proc (Bayl Univ Med Cent) 2001;14:339-46.

11.     Pane GA, Farner MC, Salness KA. Health care access problems of medically indigent emergency department walk-in patients. Ann Emerg Med 1991;20:730-3.

12.     Waller AE, Hohenhaus SM, Shah PJ, Stern EA. Development and validation of an emergency department screening and referral protocol for victims of domestic violence. Ann Emerg Med 1996;27:754-60.

13.     Rockett IR, Putnam SL, Jia H, Smith GS. Assessing substance abuse treatment need: a statewide hospital emergency department study. Ann Emerg Med 2003;41:802-13.

14.     Haukoos JS, Hopkins E, Conroy AA, et al. Routine opt-out rapid HIV screening and detection of HIV infection in emergency department patients. JAMA : the journal of the American Medical Association 2010;304:284-92.

15.     Goldberg WG, Tomlanovich MC. Domestic violence victims in the emergency department. New findings. JAMA : the journal of the American Medical Association 1984;251:3259-64.

16.     Carpenter C, Bromley M, Caterino JM, et al. Optimal Older Adult Emergency Care: Introducing Multidisciplinary Geriatric Emergency Department Guidelines from the American College of Emergency Physicians, American Geriatrics Society, Emergency Nurses Association, and Society for Academic Emergency Medicine. Academic Emergency Medicine (In Press) 2014.

17.     Stevens TB, Richmond NL, Pereira GF, Shenvi CL, Platts-Mills TF. Prevalence of Non-Medical Problems Among Older Adults Presenting to the Emergency Department Academic Emergency Medicine (In Press) 2014.

18.      Tanabe P, Gimbel R, Yarnold PR, Adams JG. The Emergency Severity Index (version 3) 5-level triage system scores predict ED resource consumption. J Emerg Nurs 2004;30:22-9.

19.      Callahan CM, Unverzagt FW, Hui SL, Perkins AJ, Hendrie HC. Six-item screener to identify cognitive impairment among potential subjects for clinical research. Med Care 2002;40:771-81.

20.      Kaiser MJ, Bauer JM, Ramsch C, et al. Validation of the Mini Nutritional Assessment short-form (MNA-SF): a practical tool for identification of nutritional status. J Nutr Health Aging 2009;13:782-8.

21.      Serra-Prat M, Palomera M, Gomez C, et al. Oropharyngeal dysphagia as a risk factor for malnutrition and lower respiratory tract infection in independently living older persons: a population-based prospective study. Age Ageing 2012;41:376-81.

22.      Hickson M. Malnutrition and ageing. Postgrad Med J 2006;82:2-8.

23.      Wellman NS, Weddle DO, Kranz S, Brain CT. Elder insecurities: poverty, hunger, and malnutrition. J Am Diet Assoc 1997;97:S120-2.

24.      Cabrera MA, Mesas AE, Garcia AR, de Andrade SM. Malnutrition and depression among community-dwelling elderly people. J Am Med Dir Assoc 2007;8:582-4.

25.      wolfe WS, olson CM, Kendall A, Frongillo EA. Understanding Food Insecurity in the Elderly: A Conceptual Framework. Journal of Nutrition Education 1996;28:92-100.

26.      Zadak Z, Hyspler R, Ticha A, Vlcek J. Polypharmacy and malnutrition. Curr Opin Clin Nutr Metab Care 2013;16:50-5.

27.      Bhatti GK, Howard AC, David EE, inventors; Dosage form for Parkinson's disease, spasticity and muscle spasms. USA. 1992.

28.      Mangweth-Matzek B, Rupp CI, Hausmann A, et al. Never too old for eating disorders or body dissatisfaction: a community study of elderly women. The International journal of eating disorders 2006;39:583-6.

29.      Gagne DA, Von Holle A, Brownley KA, et al. Eating disorder symptoms and weight and shape concerns in a large web-based convenience sample of women ages 50 and above: results of the Gender and Body Image (GABI) study. The International journal of eating disorders 2012;45:832-44.

30.      Rubenstein LZ, Harker JO, Salva A, Guigoz Y, Vellas B. Screening for undernutrition in geriatric practice: developing the short-form mini-nutritional assessment (MNA-SF). The journals of gerontology Series A, Biological sciences and medical sciences 2001;56:M366-72.

31.      Omran ML, Morley JE. Assessment of protein energy malnutrition in older persons, part I: History, examination, body composition, and screening tools. Nutrition 2000;16:50-63.

32.      Sheiham A, Steele JG, Marcenes W, et al. The relationship among dental status, nutrient intake, and nutritional status in older people. J Dent Res 2001;80:408-13.

33.      Finch S, Doyle W, Lowe C. National diet and national survey People aged 65 years and over; volume 1 report of the diet and nutrition survey. In: Ministry of Agriculture FaF, ed. London: The Stationary Office; 1998.

34.      Jencks SF, Williams MV, Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. The New England journal of medicine 2009;360:1418-28.

35.      Stratton RJ, Hebuterne X, Elia M. A systematic review and meta-analysis of the impact of oral nutritional supplements on hospital readmissions. Ageing Res Rev 2013;12:884-97.

36.      Cawood AL, Elia M, Stratton RJ. Systematic review and meta-analysis of the effects of high protein oral nutritional supplements. Ageing Res Rev 2012;11:278-96.