WORKING PAPER

Quality Indicators for Malnutrition for Vulnerable Community-Dwelling and Hospitalized Older Persons

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RAND HEALTH

QUALITY INDICATORS FOR MALNUTRITION FOR VULNERABLE COMMUNITY-DWELLING AND HOSPITALIZED OLDER PERSONS

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INTRODUCTION

As a population, older adults are more likely than younger ones to be afflicted with a variety of age-related diseases and functional impairments that may interfere with the maintenance of good nutritional status. This is particularly true of "vulnerable elders", defined as individuals age 65 and older who are at increased risk for functional decline and death. This population is also at increased risk of drug-induced nutritional deficiencies due to the number of prescription drugs they take. As a result of these potential risks for malnutrition, the Department of Health and Human Services' health goals for the nation, *Healthy People 2000*,(1) has identified nutrition as a priority area. In addition, the American Academy of Family Physicians, the American Dietetic Association and the National Council on the Aging, Inc. have created the Nutrition Screening Initiative (NSI) to promote nutrition screening and better nutritional care of older persons.(2)

The term "malnutrition" can encompass a wide range of deficiencies (e.g., protein-energy, vitamins, fiber, water) and excesses (e.g., obesity, hypervitaminosis), which may or may not be clearly associated with adverse health outcomes.(3) Among these, undernutrition has emerged as a priority area in caring for older persons. For example, an expert panel recently ranked undernutrition as third leading condition in hospital and home care sites and the fourth leading condition in office practice and nursing home sites for which quality improvement efforts would enhance the functional health of older persons.(4) Accordingly, the potential quality indicators (QIs) presented in this paper focus specifically on energy undernutrition, as well as on obesity. This paper does not address vitamin, mineral, fiber, or water disturbances.

Developing quality indicators for malnutrition in older persons is problematic because there is no universally accepted clinical definition of malnutrition(5) and because the amount of research conducted on malnutrition in older persons, though voluminous, has not systemically focused on issues of quality of care. As a result, there are substantial knowledge gaps in the literature, and most of the proposed quality indicators in this paper are not supported by randomized clinical trials. When clinical trials have been

available, almost all have been small and many have studied patients who met narrow entry criteria. Moreover, many of the trials do not meet the highest quality of methodological rigor (e.g., concealed randomization and complete follow-up). Thus, even the clinical trial evidence cannot be regarded as conclusive when evaluating the proposed quality indicators in this paper.

METHODS

The methods for developing these quality indicators, including literature review and expert panel consideration, are detailed in a preceding paper.(6) For malnutrition, the literature search began with the author's own extensive files from a prior review on the subject.(3) and the structured literature review identified 3,753 additional titles, from which abstracts and articles were identified that were relevant to this report. Based on the literature and the authors' expertise, 17 potential quality indicators were proposed.

Of these, three potential quality indicators dealt exclusively with elders in nursing homes and are not reported here. Six potential indicators applied to hospitalized patients and eight potential indicators applied to community-dwelling patients. These 14 indicators are considered here.

RESULTS

Of the 14 potential quality indicators, eight were judged valid by the expert panel process (see Quality Indicator table) and 6 were not accepted The literature summaries that support each of the indicators judged to be valid by the expert panel process are described below.

Quality Indicator #1

Weight measurement

ALL community-dwelling patients should be weighed at each physician office visit and these weights should be documented in the medical record **BECAUSE** this is an inexpensive method to screen for energy undernutrition and obesity that has prognostic importance.

   Supporting evidence: There are no clinical trials supporting the routine measurement of weight having a positive effect on health outcomes. However, weight loss and low body mass index (BMI) have been associated with adverse outcomes in older persons and can be identified by routine measurement. In a 4-year cohort study, the annual incidence of involuntary weight loss (defined as loss of more than 4% of body weight) among community-dwelling veterans was 13.1%. Over a 2-year follow-up period, involuntary weight losers had an increased risk of mortality (RR = 2.4, 95% CI = 1.3 to 4.4), which was 28% among weight losers and 11% among those who did not lose weight. Voluntary weight losers had a 36% mortality rate during this time, suggesting that intentional weight loss may carry as poor a prognosis as unintentional weight loss in this population.(7) Two longitudinal studies also suggest that weight loss in later life predict mortality. In one, older persons who lost 10% of their body weight or more between ages 50 and 70 years had higher adjusted of mortality (men: RR = 1.69, 95% CI = 1.19 to 1.65; women: RR =1.62, 95% CI = 1.45 to 1.97).(8) In the other, women ≥ 55 years of age who had an episode of unintentional weight loss had an adjusted odds ratio of 1.45 (95% CI 1.24, 1.70) for all-cause 5-year mortality.(9) However, the time span utilized in these latter definitions are impractical in clinical practice. Among Alzheimer's patients followed for up to 6 years, ≥ 5% weight loss in any year before death predicted mortality (relative risk 1.5, 95% CI 1.09, 2.07); 22% of Alzheimer's patients experienced such weight loss.(10) Other definitions (e.g., 7.5% loss within 6 months) have been employed in small studies.(11) Among community-dwelling old persons, body mass index (BMI) demonstrates a "U" shaped relation with functional impairment, with increased risk among those at the lowest and highest BMIs.(12)

Data on the risks associated with obesity in older persons are less consistent. Several cohort studies have demonstrated that high BMI does not predict mortality, and that it may even be protective against early death in older persons.(13-15) However, other studies indicate that obesity predicts mortality even in the 75 years or older age group(16) and is related to the development of functional impairment.(12,17)

There have been few randomized clinical trials indicating that treatment of community-dwelling older persons who are at either extremes of BMI leads to improved clinical outcomes. The TONE study found that elderly overweight hypertensives who were assigned to either the weight loss or to the weight loss and reduced sodium intake arms of a randomized clinical trial improved their blood pressure control.(18) Epidemiological data from the Framingham cohort also indicated improvement in arthritis among obese patients who have lost weight.(19) In this study, a decrease in weight of approximately 5 kg in the preceding 10 years afforded a 50% reduction in the risk of symptomatic osteoarthritis.(7)

Quality Indicator #2

Document Weight Loss

IF a vulnerable elder has involuntary loss of $\geq$ 10% body weight over one year or less, **THEN** weight loss (or a related disorder) should be documented in the medical record as an indication that the physician recognized malnutrition as a potential problem **BECAUSE** some patients with weight loss have potentially reversible disorders.

Supporting evidence: To date, there have been no published randomized clinical trials that provide evidence for the reversibility of weight loss or improved outcomes as a result of interventions. Nevertheless, many of the causes of weight loss (e.g., depression, hyperthyroidism, gastrointestinal diseases, cancer)(11,20) are treatable with therapies that have been demonstrated to be effective in randomized clinical trials.

Quality Indicator #3

Evaluate Weight Loss and Hypoalbuminemia

IF a community-dwelling vulnerable elder has documented involuntary weight loss or hypoalbuminemia (< 3.5 g/dL), **THEN** she or he should receive an evaluation for potentially reversible causes of poor nutritional intake **BECAUSE** there are many treatable contributors to malnutrition.

Supporting evidence: Many of the causes of weight loss (e.g., depression, hyperthyroidism, gastrointestinal diseases, cancer)(11,20) are treatable with therapies that have been demonstrated to be effective in randomized clinical trials. Serum albumin is the best-studied serum protein and has prognostic value for subsequent mortality and morbidity in community-dwelling older persons.(21-23) A recent study identified risk factors (Table 1), including some that may be reversible, for hypoalbuminemia among community-dwelling older persons.(24)

Table 2 lists medical and nutrition-related factors that may cause undernutrition. The linkages between correcting the potentially modifiable factors listed above, restoring serum albumin to normal values, and reducing the adverse sequelae associated with hypoalbuminemia have yet to be established. Oral health status has been associated weight loss, although trials have not demonstrated specific effects of treatment in this age group.(25,26) The optimal evaluation of weight loss or hypoalbuminemia in older persons has not been determined.

Quality Indicator #4

Evaluate Comorbid Conditions

IF a community-dwelling vulnerable elder has documented involuntary weight loss or hypoalbuminemia (< 3.5 g/dL) **THEN** he or she should receive an evaluation for potentially relevant comorbid conditions including:

- medications that might be associated with decreased appetite (e.g., digoxin, fluoxetine, anticholinergics)
- depressive symptoms, and
- cognitive impairment

BECAUSE each of these represents a treatable contributor to malnutrition.

Supporting evidence: There is no evidence from clinical trials that treatment of co-morbid conditions (other than depression) associated with weight loss and hypoalbuminemia leads to improved appetite, weight gain, and better patient outcomes. Nevertheless, many co-morbid conditions are treatable with therapies that have been demonstrated to be effective in clinical trials. Therefore, an indirect argument can be made that identifying and treating co-morbid conditions is important. Medication, depression, and cognitive impairment can all affect food intake, either directly or indirectly. Certain medication use (e.g., digoxin, antibiotics, selective serotinergic reuptake inhibitors) has been linked to decreased appetite;(27,28) therefore, discontinuing the offending agents would presumably lead to improved appetites. The treatment of depression in older persons has been demonstrated to improve quality of life and ameliorate symptoms, including weight loss. Although medication therapy of Alzheimer's disease has not specifically been shown to improve appetite or weight, detection of dementia and implementation of adequate social support may help ensure that afflicted persons have food obtained and prepared for them, and fed to them as needed.(29)

Quality Indicator #5

Document Nutritional Status of Inpatient

IF a vulnerable elder is hospitalized, **THEN** his or her nutritional status should be documented during the hospitalization by evaluation of oral intake or serum biochemical testing (e.g., albumin, prealbumin, or cholesterol) **BECAUSE** each of these measures has prognostic significance and can identify older

persons at risk of malnutrition or adverse outcomes (e.g., complications, prolonged length of stay, in-hospital and up to one-year mortality).

Supporting evidence: Nutritional parameters, including intake and biochemical tests, have demonstrated predictive ability for adverse outcomes among hospitalized older persons. Yet there have been few data supporting the benefit of monitoring nutritional intake among hospitalized patients. However, a prospective observational study demonstrated that low caloric intake (< 30% of estimated need) during the first three days of hospitalization could predict in-hospital mortality independently of serum albumin, lymphocytopenia, and activity of daily living impairment upon admission.(30) A recent study identified poor nutrient intake (< 50% of calculated maintenance energy requirements) in 21% of hospitalized older persons.(31)

Nurses and aides routinely observe dietary intake and thus offer the potential for inexpensive detection of potential nutritional disorders among hospitalized older persons. In general, though, the methods for communicating poor dietary intake observed by nursing staff to physicians have been informal and haphazard. Whether formal calorie counts obtained by food records provide additional value beyond nurse and aide observations has not been established. One report documented that among hospitalized patients, a one-day calorie count corresponded very closely to the values obtained by a three-day calorie count for energy and protein intake.(32)

Although the relationship between serum albumin and nutritional intake is not well established, hypoalbuminemia is commonly considered a sign of malnutrition. In fact, low serum albumin levels may be a better measure of inflammation and associated decrease in albumin synthesis, increase in albumin degradation, and transcapillary leakage than of malnutrition. Nevertheless, several studies have associated low serum albumin in hospitalized older persons (measured at various times during the hospitalization) with in-hospital complications, longer hospital stays, more frequent re-admissions, in-hospital mortality, and increased mortality at 90 days and at one year.(30,33-46) When considering mortality, the lower the albumin level, the higher the risk of death. Although the optimal threshold for

identifying an increased risk of mortality has not yet been established, it may be considerably higher than the traditional 3.5 g/dL cut-point used to define protein energy undernutrition.(47) Prealbumin has also been demonstrated to have long-term prognostic value for mortality for patients admitted to a geriatric assessment unit.(48)

Low or falling serum cholesterol has been explored as another nutritional marker. In a case control study of older persons with normal cholesterol levels on admission to the hospital (≥160 mg/dL), those whose cholesterol levels fell to ≤120 mg/dL during hospitalization had more infectious and non-infectious complications, and their length of stay was nearly three times as long as those who maintained normal cholesterol levels. Mortality rates were higher in the acquired hypocholesterolemia group, though not significantly so.(49) However, acquired hypocholesterolemia may not be nutritionally mediated. Recent reports support the hypotheses that ongoing inflammation and proinflammatory cytokines, particularly IL-6, may be responsible for acquired hypocholesterolemia.(50)

Quality Indicator # 6

Alternative Alimentation in Hospitalized Older Persons

IF a hospitalized vulnerable elder is unable to take foods orally for more than 72 hours, **THEN** alternative alimentation (e.g., enteral or parenteral) should be offered **BECAUSE** such patients are at high risk of malnutrition that can improve with caloric supplementation.

Supporting evidence: Some, but not all, studies of hospitalized elderly persons support the reversibility of undernutrition. To date, there have been no evidence-based protocols for determining when alternative feeding methods should be employed in hospitalized older persons who are not eating. A meta-analysis indicated that hospitalized persons with malnutrition who were started on some type of nutritional intervention on the third hospital day or before had an average length of stay of 3.0 days less than those who were started on the fourth or later hospital day.(51) Decisions to initiate and continue

alimentation must take into account that clinical condition and prognosis of the patient and the patient's preferences.

A randomized clinical trial of administering a 600 kcal/20 g protein supplementation twice daily to patients who had sustained a stroke and who had anthropometric evidence of undernutrition demonstrated a smaller drop in serum albumin in the supplemented group than in the control group (mean drop 1.5 g/L compared to 4.4 g/L, p = 0.025) and a non-significant reduction in three-month mortality (10% in the supplemented group versus 35% in the control group, p = 0.12).(52)

A recent meta-analysis of oral and enteral supplementation concluded that the treatment groups showed consistently improved changes in body weight and anthropometry and lower odds ratios for death (pooled odds ratio = 0.66, 95% CI = 0.48 to 0.91). Subgroup analyses showed comparable benefits, including the subgroup age > 70 years and the subgroup of the unwell.(53) However, other than in specific instances (e.g., hip fracture), few randomized clinical trial data support the effectiveness of such treatments in hospitalized older persons. One clinical trial did demonstrate the benefit of providing a 500 kcal daily liquid supplement to patients who had been discharged from hospitals following respiratory infections.(54) However, another trial demonstrated no benefit of supplements among hospitalized elderly persons.(55) A randomized clinical trial of supplements for demented patients with low body mass index who were admitted to a psychiatric hospital and who received a 600 kcal oral supplement demonstrated significant increases, compared to the placebo group, in weight (3.7 kg versus 0.6 kg), midarm muscle circumference (0.5 cm versus no change), and triceps skin fold thickness (1.5 mm versus 0.5 mm) at 12 weeks.(56)

Several case series also provide evidence of the potential to treat energy undernutrition. In the first, oral or enteral supplementation of hospitalized elderly malnourished patients led to improved albumin, lymphocyte counts, stem cell function, and reduced anergy.(57) A second case series of persons who had lost at least 20% of their body weight or at least 10% in three months demonstrated improvement

in nutritional parameters, including serum albumin, after receiving approximately 300% of resting energy expenditures by giving enteral nutrition via a nasogastric tube during the night for four weeks.(58)

Quality Indicator # 7

Supplement Patients with Hip Fracture

IF a vulnerable elder who was hospitalized for a hip fracture has evidence of nutritional deficiency (thin body habitus or low serum albumin or prealbumin), **THEN** oral or enteral nutritional protein-energy supplementation should be initiated post-operatively **BECAUSE** randomized clinical trials have indicated better outcomes in these patients.

Supporting evidence: Two European and one small American randomized clinical trials support the effectiveness of nutritional interventions for patients with femoral neck fractures. It is uncertain whether all hip fracture patients should receive protein or energy supplementation, or whether these supplements should be restricted only to those with anthropometric, energy intake, or biochemical evidence of malnutrition. In the first study, women who were classified as thin or very thin based on arm circumference and triceps skin fold thickness were provided overnight supplementary nasogastric tube feedings of 1000 calories, which were continued until discharge or death. Rehabilitation time to independent mobility (median 16 days in the treated group compared to 23 days in the control group, $p = 0.02$) and hospital stay was shortened (median 29 days in the treated group compared to 38 days in the control group, $p = 0.04$), particularly among the very thin.(59) The second, more recent randomized clinical trial assigned consecutive hip fracture patients (regardless of nutritional status) to supplementation with 254 calories per day orally for a mean of 32 days or to usual care. The average baseline energy intake of these patients was 1100 kcal, which was below their estimated nutritional needs (1800 kcal). Those in the supplemented group had shorter total length of stays (hospital plus rehabilitation) (median duration 24 days in the supplemented group and 40 days in the control group) and fewer complications and deaths (as a combined measure) (44% in the supplemented versus 74% in the

control group at six months).(60) The third study, a small trial of nightly enteral nutritional support

(regardless of baseline nutritional status) for an average of 15 days, did not demonstrate a reduction in in-

hospital complications or mortality, but six-month mortality was significantly less (0% in the treatment

group compared to 50% in the control group).(61) Nevertheless, these findings should be interpreted with

caution because of the limited power of this study, which included only 17 subjects. It is uncertain how

much of the benefits found in these studies are derived from the caloric supplementation versus protein

supplementation. In a recent trial of older persons who had sustained hip fractures within the prior two

weeks, a 20 g/day protein supplement for six months led to increased insulin-like growth factor-1 levels,

less bone loss, and shorter rehabilitation ward time (median stay 33 days in the treated group compared to

54 days in the control group, p = 0.02).(62) A systematic review of nutritional supplementation after

treatment of hip fracture found evidence for the effectiveness of oral protein and energy feeds, but

classified the evidence as weak.(63)

Quality Indicator #8

Gastrostomy Feeding in Stroke Patients

IF a vulnerable elder with a stroke has persistent dysphagia at 14 days, **THEN** a gastrostomy or

jejunostomy tube should be considered for enteral feeding **BECAUSE** this method of feeding has

improved outcomes compared to oral feeding.

        Supporting evidence: Patients who cannot eat but for whom the prognosis after a stroke is

consistent with an acceptable quality of life benefit nutritionally from tube feeding. A small (30 subjects)

randomized clinical trial demonstrated that patients with persistent dysphagia (defined as an absence of

normal gag reflex, the inability to swallow 50 mL of sterile water easily without choking, or both) at 14

days after acute stroke who were randomized to gastrostomy tube feeding received more of their

prescribed feedings and had higher albumin levels (30.1 g/L in the gastrostomy group versus 22.3 g/L in

the nasogastric tube group) and lower mortality (12% in the gastrostomy group versus 57% in the

nasogastric tube group, p < 0.05) at six weeks. (64) The decision of whether to place a gastrostomy tube in this situation depends upon the preferences of the patient and family as well as other prognostic considerations.

DISCUSSION

Despite decades of research and increasing recognition of the importance of malnutrition in older persons, there are few valid quality indicators that can be used to assess the care that vulnerable elderly persons receive regarding this problem. The paucity of indicators is likely the result of the poverty of research aimed at answering the questions of what constitutes good nutritional care for older persons and how is this best measured. Instead, the emphasis has been on epidemiologic studies, case series, and some randomized clinical trials that have been limited by selection criteria, sample size and design issues. The purposes of these studies have been to describe the extent of the problem, identify valid measures of malnutrition, and develop interventions that may be effective for select populations.   Translating these studies to quality indicators frequently requires substantial assumptions. The research base for establishing quality indicators for malnutrition has also been limited by the difficulty and expense of conducting such research. Nutrition is one component of an individual ecosystem that includes disease and lifestyle issues, such as physical conditioning and smoking. Isolating the nutritional component from the others may be impossible. For example, the use of serum protein status, a widely utilized measure of nutritional status, is also a measure of inflammation.(65) Thus, when a septic older person is hospitalized it is impossible to determine whether the low serum albumin is the result of sepsis or malnutrition, or both. As a result, both the selection criteria for studies and the outcome measures employed frequently lack specificity for malnutrition. Moreover, this problem is particularly difficult to study because of societal values regarding feeding. For example, despite the lack of evidence for the use of feeding tubes in dementia,(66) they are still widely used and it would be extremely difficult to conduct a clinical trial

that would include a group that was randomized not to receive a tube. Hence, a comprehensive inventory

of sound data to generate evidence-based quality indicators may never be available.

In spite of such limitations, the expert panel was able to agree on eight quality indicators.

Although these quality indicators span a wide range of management, they are not comprehensive. For

example, an acceptable quality indicator about a treatment approach (e.g., nutritional supplements or

dietitian referral) to weight loss or hypoabuminemia in community settings could not be developed based

on the existing evidence and the panel's judgment. Moreover, there are likely to be some difficulties in

operationalizing these quality indicators. In all efforts to evaluate quality of care, the adequacy of

documentation (e.g., discussions about insertion of a feeding tube after stroke) remains a limiting factor.

Although some of the proposed quality indicators are readily ascertainable (e.g., weights in ambulatory

records), others (e.g., the evaluation of oral intake in hospitalized older persons) are more problematic.

The proposed quality indicators also require some degree of judgment. Although criteria from the

original studies can be used, these are frequently strict research criteria and may not fit clinical situations.

Finally, it must be recognized that the quality of care for malnutrition in vulnerable older persons is an

evolving concept. As new research is conducted, standards may change. Such new literature also

requires time to become disseminated and incorporated into clinical practice. Hence, there is likely be a

lag period between best practice and usual practice.

In summary, despite the importance of undernutrition among older persons receiving health care

in community and hospital settings, there are few quality indicators that have substantial evidence to

support them. Through an intensive literature search and synthesis couple with a two-stage expert panel

process, we have been able to identify eight valid quality indicators that can serve as measures that may

discriminate between quality and substandard care.

Table 1: Factors associated with hypoalbuminemia
in community-dwelling older person

1. Age >= 65 years

2. Being on welfare

3. Having a condition that interferes with eating

4. Vomiting >= 3 days per month

5. Surgery for a gastrointestinal tumor

6. Heart failure

7. Recurrent coughing attacks

8. Feeling tired or worn out

9. Poor dental condition

10. Little or no exercise

11. Low salt diet

12. Currently smoking

Table 2. Evaluation of weight loss or hypoalbuminemia

Potential cause	Evaluation strategy
Medical conditions	
Hyperthyroidism	Thyrotropin (TSH)
Gastrointestinal diseases (e.g., malabsorption, inflammatory bowel disease)	Begin with testing for malabsorption and fecal occult blood or endoscopy. Further studies as indicated.
Cancer (e.g., bowel, lung)	Fecal occult blood testing, chest x-ray, lower endoscopy
Nutrition-related factors	
Dental status	Oral examination or referral to a dentist)
Food security	Specific questions about financial status, referral to social worker
Food-related functional status	Specific questions about meal preparation and feeding
Appetite and dietary intake	Dietitian referral or 72 hour-caloric count
Swallowing ability	Bedside swallowing study, referral for swallowing study or videofluoroscopy
Disease-related dietary restrictions (e.g., low salt, low protein)	
Co-morbid conditions	
Assessment of medications that might be associated with decreased appetite (e.g., digoxin, fluoxetine, anticholinergics)	
Depression	Short depression screen (e.g., using the Geriatric Depression Scale)
Cognitive impairment	Short mental status screen (e.g., using the Mini-mental State Examination)

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