Low Nutrient Intake Contributes to Adverse Clinical Outcomes in Hospitalized Elderly Patients

A prospective cohort study on hospitalized elderly patients revealed that inadequate nutrient intake during hospitalization was associated with adverse clinical outcomes and increased morbidity. Because this occurred in patients who were initially assessed as being in good health, it emphasizes the need for continuous nutritional surveillance of hospitalized elderly patients.

It has been more than 2 decades since Butterworth published his landmark paper identifying malnutrition in the hospital as common and often unrecognized.[1] It is hard to imagine that something as fundamental as nutrition continues to be undervalued as a key component of a patient's care. Medical conditions, medications, age, health habits such as alcohol consumption, social factors, and of course, food intake can affect nutrition status.[2] Despite this knowledge, malnutrition in the hospital still occurs. Nutrition status is an important determinant of clinical outcome, yet the prevalence of malnutrition in the hospital continues to range between 30% and 65%.[3,4] Patients who are malnourished tend to have longer hospital stays, delayed wound healing, higher incidences of complications, higher readmission rate, and higher mortality rates than their well-nourished counterparts.[2–6] Elderly patients are at particular nutrition risk owing to reduced appetite and response to thirst, existing medical problems, increased medications, oral and swallowing problems, depression, decreased income, and social isolation.[2,4,7] Once this population becomes malnourished, they are at greater risk for adverse medical outcomes, including death, than well-nourished elderly patients.[8,9]

Nutrition screening serves to identify patients at risk for malnutrition by identifying parameters known to be associated with nutrition problems, and it can be done in several settings.[10] In the hospital, screening is usually done within 24–72 hours of hospital admission. Nutrition screening flags whether patients are at risk for malnutrition and can help prioritize the timing and frequency of the nutrition intervention required of the clinical nutrition staff. Patients identified as being at nutritional risk can go on to receive a nutrition assessment.[2,10–12] Nutrition assessment is more in-depth than screening and serves to define nutrition status from medical, nutrition, and medication histories, clinical examination, anthropometry, and laboratory data. It also highlights the risk of developing nutrition-related medical complications.[2,7,10] After the nutrition assessment is completed, which takes 1–2 hours/patient,[7] appropriate interventions are implemented to treat and prevent further deterioration in nutrition status. Effective nutrition screening needs to be quick and cost-effective and needs to use information available from routine laboratory data, anthropometric data, medical factors that influence nutrition status, and basic nutrition history.[2,7,11] Screening tools assess for variables that are associated with poor nutrition status: weight loss, weight in relation to height, serum albumin, total lymphocyte count, and findings from the history such as gastrointestinal problems (nausea, vomiting, diarrhea), fluid retention, changes in appetite, anorexia, chewing/swallowing problems, taste alterations, change in stool color, and presence of food allergies.[5,7,11,13,14] It has been argued that treatment for a screen-detected disease is more effective than treatment for a symptom-detected disease.[2] Nutrition interventions started after initiation of malnutrition are not as effective, a finding that is particularly relevant to the older adult population.

Many studies have addressed the need for screening.[1–16] What has not been brought forward, however, is the need for surveillance of patients during their hospital stay, in addition to the screen upon admission. To this end, Sullivan et al.[17] recently conducted a prospective cohort study on the hospitalized elderly (> 65 years) to assess whether inadequate nutrient intake during hospitalization contributed to nutrition deficits and the risk of adverse outcomes. All patients hospitalized for at least 4 days were eligible unless they had metastatic cancer or were receiving palliative care for other terminal conditions. Several patient evaluations were completed within 48 hours of admission: social, nutrition, and functional status history; complete list of all primary and secondary diagnoses; complete clinical and biochemical nutrition assessment; neuropsychological evaluation; and various other illness severity measures such as hematocrit, white blood cell count, and blood urea nitrogen levels. A nutrition assessment included anthropometric measures (midarm muscle circumference, subscapular skinfold thickness, triceps skinfold thickness), weight measurement if patients appeared euvolemic, measurement of serum secretory protein concentrations (albumin, prealbumin, transferrin), and measurement of total lymphocyte count. Participants were reweighed and had their serum secretory protein concentrations and total lymphocyte counts measured every 7 days. A second comprehensive assessment was completed for each patient at discharge.[17] Complete energy intake estimates were obtained for the first 3 days and thereafter for alternate days until hospital discharge using a proto-

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col that included direct patient observation and recording of volitional intake and enteral and parenteral nutrition support. Patients with a > 25% day-to-day variation in amount of food eaten and/or who received nutrition support had their nutrient intakes monitored daily. Any study patient with a nutrient intake of < 50% of calculated energy requirements for a given meal was assessed more closely at subsequent meals until the intake stabilized at 75% of requirements. This was done to determine possible factors contributing to the poor nutrient intake, including chewing and swallowing difficulties, dislike of food, lack of appetite for food provided, nausea, an order to have nothing by mouth, placement on a low-energy diet, confusion or coma, or inadequate feeding assistance. All participants were tracked for at least 90 days after admission. Dates of all deaths were recorded. No one was lost to follow-up.[17]

A total of 497 patients were studied with a median length of stay of 8 days. Patients were divided into two groups. Those whose subsequent daily nutrient intake was later found to be < 50% of their calculated requirement using the Harris-Benedict equation for basal metabolic rate, plus a 25% stress and activity factor, were referred to as the Low Nutrient Intake Group. The intake of the All Others Group was > 50% of their calculated requirement. The Low Nutrient Intake Group comprised 21% of all patients, and The All Others Group was made up of 79% of all patients. The Low Nutrient Intake Group, upon admission, had a greater body mass index (BMI, kg/m^2) and greater anthropometric measures and were more likely to consider their health to be good or excellent, to be admitted for elective reasons (as opposed to urgent or emergent reasons), and to have an admission diagnosis of a gastrointestinal disorder or cerebrovascular accident (Table 1). Otherwise, the two groups did not differ in any admission assessments and indicators for illness severity.[17]

Although similar with respect to admission illness severity, the two groups had very different clinical outcomes (Table 2). The Low Nutrient Intake Group had lower mean discharge serum albumin and prealbumin and experienced greater weight loss during hospitalization. At the time of death or discharge, edema or ascites that was new or more severe than at the time of admission occurred in 13% of the Low Nutrient Intake Group. The Low Nutrient Intake Group also had higher rates of both in-hospital mortality and overall mortality within 90 days of admission. There were several possible contributors to low intake, including patients being ordered to have nothing by mouth and not being fed by another route. In 17% of nothing-by-mouth cases, the reason for the order was not readily apparent, and these patients were usually not provided nutrients by another route. There was no between-group difference in the receipt of oral supplements or parenteral nutrition support. Patients in the Low Nutrient Intake Group were more likely to have started receiving enteral tube feeding; however, they received fewer nutrients per day from these sources than did the other nutritionally supported patients.[17] Although not speculated on by the authors, the fact that the Low Nutrient Intake Group had more admissions with gastrointestinal and cerebrovascular diseases may have contributed to the subsequent food intake problems of this group. Thus, the study by Sullivan et al.[17] is important because patients in the Low Nutrient Intake Group were apparently not at greater nutritional risk at baseline (Table 2), yet they had far worse clinical outcomes after spending only 8 days (median length of stay) in the hospital. This study highlights the fact that poor nutrition intake by patients initially assessed as in good health can have serious consequences within a short time.

Given the importance of nutrition screening and timely nutrition interventions to treat and prevent further deteriorations in nutrition status, what systems are available

Table 1. Characteristics of the Low Nutrient Intake Group and the All Others Group upon Admission

Characteristic[a]	Low Nutrient Intake Group ($n = 102$)	All Others Group ($n = 395$)
Age (years)	73.6 ± 5.8	73.8 ± 5.8
BMI (kg/m^2)	26.5 ± 5.4	25.2 ± 5.3
Health assessed as poor-fair (%)	50	63[b]
Health assessed as good-excellent (%)	50	38[b]
Admitted with acute problem (%)	98	97
Functionally dependent (%)	24	20
Prevalence of GI disorders (%)	49	34*
Prevalence of CV incidents (%)	5	1†

Note: BMI = body mass index; GI = gastrointestinal; and CV = cerebrovascular.

[a] There were no significant differences in characteristics between the Low Nutrient Intake Group and the All Others Group upon admission, except when noted.

[b] Significant difference in All Others Group between patients assessing themselves as poor-fair and those assessing themselves as good-excellent.

* Indicates $p < 0.01$.

† Indicates $p < 0.02$.

Source: adapted from reference 17.

Table 2. Clinical Parameters Assessed at Admission and Discharge and Clinical Outcomes of the Low Nutrient Intake Group and the All Others Group

Clinical Parameter[a]	Low Nutrient Intake Group ($n = 102$)	All Others Group ($n = 395$)
On admission:		
Serum albumin (g/L)	36.6 ± 6.2	36.6 ± 5.6
Serum prealbumin (mg/L)	218 ± 84	216 ± 75
On discharge:[a]		
Serum albumin[b] (g/L)	29.1 ± 6.7*	33.2 ± 6.1*
Serum prealbumin[b] (mg/L)	162 ± 69*	205 ± 75*
Clinical outcome[c]		
Functional dependence at discharge (%)	27.5†	16†
In-hospital mortality (%)	11.8†	1.5†
Death within 90 days of admission (%)	15.7†	5.8†

[a] Values in rows sharing a superscript are significantly different.
[b] Unadjusted mean, which was not different from mean adjusted for admission albumin, functional status, and other criteria.
[c] Values in rows sharing a superscript are significantly different.
* Indicates $p < 0.001$.
† Indicates $p < 0.05$ (comparing adjusted Relative Risk using 95% Confidence Interval).
Source: adapted from reference 17.

for the patient who is in the hospital for a more prolonged time period, during which a deterioration of nutrition status could occur? It is necessary to start with something as simple as increasing the awareness among the health care team of the true importance of nutrition status in illness and of the available nutrition assessment tools. Roubenoff et al.[11] did a study that found that after physicians were taught to recognize nutrition deficiency, they were able, using a screening device that required only routine admission data, to correctly identify all patients admitted who were at nutritional risk. After these patients were identified, there was an improvement in the number of days during which nutrition supplements were prescribed and a reduction in the number of calorically inadequate meals delivered. Next, a system of surveillance or on-going review of nutrition status is appropriate for patients in the hospital, even if the initial screen shows no nutrition problem. Poor nutrition status is often not readily apparent, and it is therefore important that indicators of nutrition status be assessed at regular intervals.[10] For older adults (> 65 years), these indicators include weight loss over time, low or high weight for height, reduced serum albumin, change in functional dependency, sustained inappropriate food intake, reduction in midarm muscle circumference, and an increase or decrease in skinfold thickness of triceps.[18]

According to Berry and Braunschweig,[19] nutrition-related information can be collected by the nurse caring at bedside for the patient. The dietitian would remain the person directing the process, but the nurse observes and assesses the patient more frequently than any other health care provider, allowing continuity of assessment over time and facilitating early detection of subtle changes in nutrition status.[19] Berry and Braunschweig's suggestion is ideal if nurses receive appropriate training in this type of physical assessment and as long as there is continuity in documentation of the patient's status. Schneider and Hebuterne[20] would concur because they strongly advocated the use of nursing staff to assist dietitians with screening. These authors recently reviewed nutrition scoring systems that are promising ways to evaluate malnutrition in the elderly and favorably discussed the Registered Nurses Nutritional Risk Classification tool as a means for nurses to screen patients upon admission.[21] This tool, however, would need modification to serve a surveillance function because it reflects historic rather than current nutrition problems.

The idea of using a screening tool for surveillance is not new. Nagel[5] describes a screening process in which rescreening is performed at intervals. Patients are initially screened for protein energy malnutrition (PEM) and are assigned to one of three levels: level A (high risk for PEM), level B (moderate risk), or level C (not at risk). Patients initially assigned to level C are rescreened again 7 days later to ensure optimal nutrition status. Furthermore, any level C patient is automatically referred to a dietitian if length of hospital stay is 14 days or longer, reflecting the concern that long stays can lead to intake problems. The results from the reapplication of the screening tool would be used to decide which patients have had deteriorations in nutrition status (compared with baseline assessment) and which patients need a further nutrition assessment to determine whether a patient may benefit from nutrition intervention. Prior to hospital discharge, a rescreen could be done to identify patients at risk for malnutrition so that appropriate nutrition care and advice can be given during

the period of healing.

Since Butterworth published his landmark paper, there have been many screening tools developed to identify patients at risk for malnutrition upon admission to the hospital. There must now be a move for continued nutritional surveillance of hospitalized patients who are at risk of developing nutritional complications during their stay. Several screening tools have the potential to be used for surveillance purposes. Regardless of what tool is used, patients with extended hospital stays require rescreening at regular intervals to identify whether they require nutrition intervention. Having a method to identify deteriorating nutrition status during the hospital stay may help to reduce disease complications and mortality and has economic implications in terms of possibly reducing length of hospital stay.

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