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A.S.P.E.N. Clinical Guidelines

Nutrition Screening, Assessment, and Intervention in Adults

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Nutrition screening, assessment, and intervention in patients with malnutrition are key components of nutrition care (Figure 1). Nutrition screening has been defined by the American Society for Parenteral and Enteral Nutrition (A.S.P.E.N.) as "a process to identify an individual who is malnourished or who is at risk for malnutrition to determine if a detailed nutrition assessment is indicated."[1] In the United States, the Joint Commission mandates nutrition screening within 24 hours of admission to an acute care center.[2] The goal of nutrition assessment is to identify any specific nutrition risk(s) or clear existence of malnutrition. Nutrition assessments may lead to recommendations for improving nutrition status (eg, some intervention such as change in diet, enteral or parenteral nutrition, or further medical assessment) or a recommendation for rescreening.[3-5] Nutrition assessment has been defined by A.S.P.E.N. as "a comprehensive approach to diagnosing nutrition problems that uses a combination of the following: medical, nutrition, and medication histories; physical examination; anthropometric measurements; and laboratory data."[1] A nutrition assessment provides the basis for a nutrition intervention. Indeed, these definitions are consistent with the Joint Commission's interpretation of a screen as an instrument used to determine whether additional information (from an assessment) is required to warrant an intervention.[2] Nutrition assessment performed by a nutrition support clinician is a rigorous process that includes obtaining diet and medical history, current clinical status, anthropometric data, laboratory data, physical assessment information, and often functional and economic information; estimating nutrient requirements; and, usually, selecting a treatment plan. Clinical skill, resource availability, and the setting determine the specific methods used to perform a clinical nutrition assessment.[6,7] Evidence-based Clinical Guidelines for specific diseases and conditions may identify assessment parameters appropriate to those conditions. In addition, reassessment and monitoring methods are an extension of the assessment process within overall nutrition care (Figure 1). As illustrated in Figure 1, clinical assessment (including rescreening and reassessment) is a continuous process.

Experts define malnutrition as "an acute, subacute or chronic state of nutrition, in which varying degrees of overnutrition or undernutrition with or without inflammatory activity have led to a change in body composition and diminished function."[1] Parameters used to diagnose malnutrition in the screening and assessment processes reflect both nutrition intake and severity and duration of disease. These factors may lead to changes in body habitus and metabolic alterations associated with poor outcome. An International Consensus Guideline Committee has proposed an approach to diagnosing malnutrition in adults based on etiology, thus integrating the present understanding of inflammatory responses to disease and trauma.[8,9] The committee proposed the following nutrition

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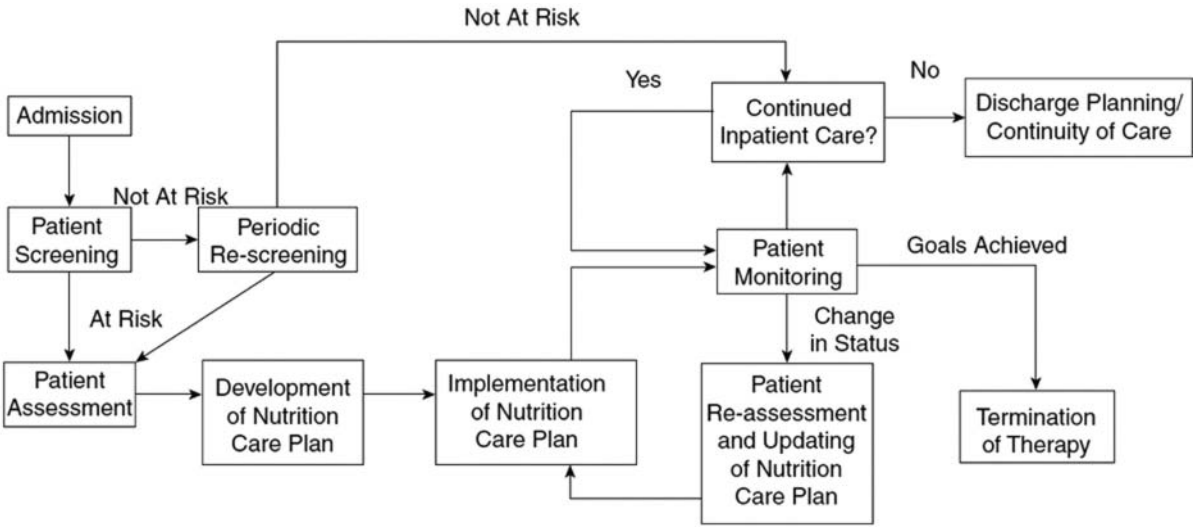

Figure 1. Nutrition care algorithm.[3]

diagnoses: (1) *starvation-related malnutrition*, which is chronic starvation without inflammation, (2) *chronic disease–related malnutrition*, where inflammation is chronic and of mild to moderate degree, and (3) *acute disease or injury–related malnutrition*, where inflammation is acute and severe.

Inflammation and related compensatory mechanisms associated with disease or injury may cause anorexia and alterations in body composition and stress metabolism. Metabolic alterations associated with inflammation are predominantly cytokine mediated and persist as long as the inflammatory stimulus is present. These metabolic alterations include elevated energy expenditure, lean tissue catabolism (proteolysis), fluid shift to the extracellular compartment, acute phase protein changes, and hyperglycemia. Decreased synthesis of negative acute phase proteins will result in reduced serum albumin, transferrin, prealbumin, and retinol binding protein concentrations that are potent indicators of poor outcome. Indeed, experts have advised that albumin and prealbumin not be used in isolation to assess nutrition status because they are fundamentally markers of inflammatory metabolism.[9-11] Positive acute phase proteins such as C-reactive protein are also potent predictors of morbidity and mortality and are elevated in the presence of inflammation.[10]

Table 1 lists screening and assessment instruments commonly cited in the literature[12] and used in the articles evaluated for these Clinical Guidelines. The table segregates parameters used in these instruments that are primarily related to anthropometry and diet, primarily related to severity of illness (disease and trauma), or other (including physical and psychological variables). Malnourished states are associated with metabolic alterations caused by disease- and trauma-triggered inflammatory response.[9] These instruments were generally developed to predict or assess undernutrition. Overnutrition and obesity are generally assessed using the body mass index and/or waist circumference guidelines in Table 2.

These Clinical Guidelines will compare clinical outcomes associated with published nutrition screening and assessment tools and the impact of further clinical assessment and nutrition intervention on clinical outcomes.

Methods

A.S.P.E.N. consists of healthcare professionals representing the disciplines of medicine, nursing, pharmacy, dietetics, and nutrition science. The mission of A.S.P.E.N. is to improve patient care by advancing the science and practice of nutrition support therapy. A.S.P.E.N. vigorously works to support quality patient care, education, and research in the fields of nutrition and metabolic support in all healthcare settings. These Clinical Guidelines were developed under the guidance of the A.S.P.E.N. Board of Directors. Promotion of safe and effective patient care by nutrition support practitioners is a critical role of A.S.P.E.N. The A.S.P.E.N. Board of Directors has published Clinical Guidelines since 1986.[26-28] A.S.P.E.N. evaluates in an ongoing process when individual Clinical Guidelines should be updated.

These A.S.P.E.N. Clinical Guidelines are based upon general conclusions of health professionals who, in developing such guidelines, have balanced potential benefits to be derived from a particular mode of medical therapy against certain risks inherent with such therapy. However, the professional judgment of the attending health professional is the primary component of quality medical care.

Table 1. Selected Nutrition Screening and Assessment Instrument Parameters

Instrument	Anthropometry and/or Diet-Related	Severity of Illness	Other (Physical, Psychological Variables or Symptoms)
Screening tools			
Birmingham Nutrition Risk Score[13]	Weight loss, BMI, appetite, ability to eat	Stress factor, (severity of diagnosis)	
Malnutrition Screening Tool[14]	Appetite, unintentional weight loss		
Malnutrition Universal Screening Tool[15]	BMI, change in weight	Presence of acute disease	
Maastricht Index[16]	Percentage ideal body weight	Albumin, prealbumin, lymphocyte count	
Nutrition Risk Classification[17]	Weight loss, percentage ideal body weight, dietary intake		Gastrointestinal function
Nutritional Risk Index[18]	Present and usual body weight	Albumin	
Nutritional Risk Screening 2002[19]	Weight loss, BMI, food intake	Diagnosis (severity)	
Prognostic Inflammatory and Nutritional Index[20]		Albumin, prealbumin, C-reactive protein, α1-acid glycoprotein	
Prognostic Nutritional Index[21]	Triceps skin fold	Albumin, transferrin, skin sensitivity	
Simple Screening Tool[22]	BMI, percentage weight loss	Albumin	
Short Nutrition Assessment Questionnaire[23]	Recent weight history, appetite, use of oral supplement or tube feeding		
Nutrition assessment tools			
Mini Nutritional Assessment[24]	Weight data, height, mid-arm circumference, calf circumference, diet history, appetite, feeding mode	Albumin, prealbumin, cholesterol, lymphocyte count	Self-perception of nutrition and health status
Subjective Global Assessment[25]	Weight history, diet history	Primary diagnosis, stress level	Physical symptoms (subcutaneous fat, muscle wasting, ankle edema, sacral edema, ascites), functional capacity, gastrointestinal symptoms

BMI, body mass index.

Table 2. Obesity Classification and Risk

Obesity Class	BMI, kg/m^2
Underweight	<18.5
Normal	18.5–24.9
Overweight	25–29.9
Obesity, class I	30–34.9
Obesity, class II	35–39.9
Obesity, class III	≥ 40
High Risk	Waist Circumference, cm Men >102 Women >88

BMI, body mass index.
Adapted from: Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults, The Evidence Report. NIH Publication No. 98-4083, September 1998, National Institute of Health. National Heart, Blood, and Lung Institute in cooperation with the National Institute of Diabetes and Digestive and Kidney Diseases.

Because guidelines cannot account for every variation in circumstances, the practitioner must always exercise professional judgment in their application. These Clinical Guidelines are intended to supplement, but not replace, professional training and judgment.

These Clinical Guidelines were created in accordance with Institute of Medicine recommendations as "systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific clinical circumstances."[29] These Clinical Guidelines are for use by healthcare professionals who provide nutrition support services and offer clinical advice for managing adult and pediatric (including adolescent) patients in inpatient and outpatient (ambulatory, home, and specialized care) settings. The utility of the Clinical Guidelines is attested to by the frequent citation of these documents in peer-reviewed publications and their frequent use by A.S.P.E.N. members and other healthcare professionals in clinical practice, academia, research, and

Table 3. Grading of Guidelines and Levels of Evidence

Grading of guidelines	
A	Supported by at least 2 level I investigations
B	Supported by 1 level I investigation
C	Supported by at least 1 level II investigation
D	Supported by at least 1 level III investigation
E	Supported by level IV or V evidence
Levels of evidence	
I	Large randomized trials with clear-cut results; low risk of false-positive (α) and/or false-negative (β) error
II	Small, randomized trials with uncertain results; moderate to high risk of false-positive (α) and/or false-negative (β) error
III	Nonrandomized cohort with contemporaneous controls.
IV	Nonrandomized cohort with historical controls
V	Case series, uncontrolled studies, and expert opinion

Table 2. Grading System. In: Dellinger RP, Carlet JM, Masur H. Introduction. *Crit Care Med.* 2004;32(suppl 11): S446. Reproduced with permission of the publisher. Copyright 2004. Society of Critical Care Medicine.[32]

industry. They guide professional clinical activities, they are helpful as educational tools, and they influence institutional practices and resource allocation.[30]

These Clinical Guidelines are formatted to promote the ability of the end user of the document to understand the strength of the literature used to grade each recommendation. Each guideline recommendation is presented as a clinically applicable statement of care and should help the reader make the best patient care decision. The best available literature was obtained and carefully reviewed. Chapter author(s) completed a thorough literature review of publications from 2005 to 2009 using Medline®, the Cochrane Central Registry of Controlled Trials, the Cochrane Database of Systematic Reviews, and other appropriate reference sources. These results of the literature search and review formed the basis of an evidence-based approach to the Clinical Guidelines. Chapter editors worked with the authors to ensure compliance with the authors' directives regarding content and format. Then the initial draft was reviewed internally to promote consistency with the other A.S.P.E.N. Clinical Guidelines and Standards and externally reviewed (by experts in the field either within our organization or outside of our organization) for appropriateness of content. The final draft was reviewed and approved by the A.S.P.E.N. Board of Directors.

The system used to categorize the level of evidence for each study or article used in the rationale of the guideline statement and to grade the guideline recommendation is outlined in Table 3.[31]

Table 4. Nutrition Support Guideline Recommendations in Adult Nutrition Screening and Assessment

Guideline Recommendations	Grade
1. Screening for nutrition risk is suggested for hospitalized patients.	E
2. Nutrition assessment is suggested for all patients who are identified to be at nutrition risk by nutrition screening.	E
3. Nutrition support intervention is recommended for patients identified by screening and assessment as at risk for malnutrition or malnourished.	C

The grade of a guideline is based on the levels of evidence of the studies used to support the guideline. A randomized controlled trial (RCT), especially one that is double blind in design, is considered to be the strongest level of evidence to support decisions regarding a therapeutic intervention in clinical medicine.[31] A systematic review (SR) is a specialized type of literature review that analyzes the results of several RCTs. A high-quality SR usually begins with a clinical question and a protocol that addresses the method to answer this question. These methods usually state how the literature is identified and assessed for quality, what data are extracted and how they are analyzed, and whether there were any deviations from the protocol during the course of the study. In most instances, meta-analysis (MA), a mathematical tool to combine data from several sources, is used to analyze the data. However, not all SRs use MAs. SRs and MAs are used in these Clinical Guidelines only to organize the evidence but are not used in the grading process.

A level of I, the highest level, was given to large RCTs where results were clear and the risk of α and β error is low (well-powered). A level of II was given to RCTs that include a relatively small number of patients or are at moderate to high risk for α and β error (underpowered). A level of III was given to cohort studies with contemporaneous controls or validation studies, and cohort studies with historic controls received a level of IV. Case series, uncontrolled studies, and articles based on expert opinion alone received a level of V.

Practice Guidelines and Rationales

Table 4 provides the entire set of guideline recommendations for Adult Nutrition Screening and Assessment.

1. Screening for nutrition risk is suggested for hospitalized patients: Grade E

Rationale. Nutrition risk, identified by nutrition screening, is associated with longer length of hospital stay, com-

Table 5. Nutrition Screening, Nutrition Risk, and Outcomes

Study	Population	Study Groups	Results	Comments
Kruizenga[23] 2005 III	Mixed medical and surgical acute care	Screened (early treatment) (n = 297) and comparable control group unscreened (standard care) (n = 291)	Decreased LOS in screened (treated) group vs control with low hand grip scores (9.5 days vs 13 days, $P = .02$), no difference between total screened group vs control	SNAQ (with early nutrition treatment in high-risk patients) vs standard facility protocol (control) ability to reduce LOS
Putwatana[40] 2005 V	Abdominal surgery	Descriptive cohort (N = 430)	NRC predicted postoperative complications (OR 2.92; 95% CI, 1.62–5.26)	NRC, MNA-SF, MST ability to predict postoperative complications
Kyle[33] 2006 V	Mixed acute care medical admissions	Descriptive cohort (N = 995)	Severely malnourished or high nutrition risk by MUST (OR 3.1; 95% CI, 2.1–4.7) and NRS 2002 (OR 2.9; 95% CI, 1.7–4.9) significantly more likely to be hospitalized >11 days	NRI, MUST, NRS 2002 ability to predict LOS
Stratton[34] 2006 V	Elderly acute care	Descriptive cohort (N = 150)	MUST predicted mortality ($P < .01$) and LOS ($P = .02$)	MUST score ability to predict outcomes
Henderson[41] 2008 V	Elderly acute care medical patients	Descriptive cohort (N = 115)	MUST predicted mortality (log rank test $P = .022$)	Birmingham Nutrition Risk and MUST scores ability to predict outcomes
Sorensen[35] 2008 V	Multinational multicenter acute care	Descriptive cohort (N = 5501)	NRS 2002 predicted LOS, morbidity, and mortality; elements of NRS 2002 were significantly related outcomes when adjusted for confounders	NRS 2002 score ability to predict outcome
Scheisser[36] 2008 V	Elective gastrointestinal surgery	Descriptive cohort (N = 608)	NRS 2002 predicted morbidity (40% complication rate in at-risk patients, $P < .001$; 54% severe complications in at-risk patients, $P < .001$; OR 2.8, $P = .001$) in at-risk patients and LOS significantly longer in high risk patients (10 vs 4 days, $P < .001$)	NRS 2002 ability to predict outcomes
Amaral[37] 2008 V	Oncology	Descriptive cohort (N = 130)	MUST best identified patients at risk for longer LOS (OR 3.24; CI, 1.50–7.00)	MUST, MST, and NRS 2002, ability to predict LOS
Schiesser[38] 2009 V	Elective gastrointestinal surgery	Descriptive cohort (N = 200)	NRS prognostic of postsurgical complications (OR 4.2; $P = .024$)	Ability of NRI and NRS to predict postsurgical complications
Ozkalkanli[39] 2009 V	Orthopedic surgery patients	Descriptive cohort (N = 256)	NRS 2002 predicted complications (OR 4.1; 95% CI, 2.0–8.5), and SGA predicted complications (OR 3.5; CI, 1.7–7.1)	Ability of NRS 2002 and SGA to predict postoperative complications

CI, 95% confidence interval; LOS, length of stay; MNA-SF, Mini Nutrition Assessment-Short Form; MST, Malnutrition Screening Tool; MUST, Malnutrition Universal Screening Tool; NRC, Nutrition Risk Classification; NRI, Nutrition Risk Index; NRS, Nutritional Risk Screening; NRS 2002, Nutrition Risk Screening 2002; OR, odds ratio; SNAQ, Short Nutrition Assessment Questionnaire; SGA, Subjective Global Assessment.

Table 6. Nutrition Assessment, Malnutrition, and Outcomes

Study	Population	Study Groups	Results	Comments
Sungurtekin[42] 2004 V	Major abdominal surgery	Descriptive cohort (N = 100)	Malnutrition scores by both SGA and NRI associated with increased risk of postoperative complications and mortality	SGA, NRI ability to predict postoperative outcomes
Martineau[43] 2005 V	Acutely ill stroke	Descriptive cohort (N = 73)	SGA-scored nutrition risk associated with increased LOS (13 vs 8 days) and increased complications (50% vs 14%); no association between SGA score and serum albumin level	Patient generated SGA ability to predict malnutrition and outcomes; independent of severity of illness (serum albumin level)
Kuzu[16] 2006 V	Major elective surgery	Descriptive cohort (N = 460)	Malnutrition scores in all methods predicted infectious and noninfectious complications. NRI: OR 3.47; CI, 2.12–5.68. MI: OR 2.30; CI, 1.43–3.71. MNA: OR 2.81; 95% CI, 0.79–9.95. SGA: OR 3.09; CI, 1.96–4.88.	NRI, MI, MNA (in subjects older than 59 years), SGA scores ability to predict outcomes
Kyle[33] 2006 V	Mixed acute care medical admissions	Descriptive cohort (N = 995)	Severely malnourished or high nutrition risk by SGA (OR 2.4; CI, 1.5–3.9), significantly more likely to be hospitalized >11 days	SGA score ability to predict LOS
Yang[47] 2007 V	Outpatient hemodialysis	Descriptive cohort (N = 50)	SGA independently predicted mortality (stepwise regression analysis (R^2 = 0.20)	SGA ability to predict mortality controlling for age, and serum albumin and transferrin
Wakahara[44] 2007 V	Gastrointestinal disease	Descriptive cohort (N = 262,110 patients with cancer)	SGA predicted LOS better than disease type, serum albumin level, skinfold thickness, and arm circumference in a multiple regression model	SGA ability to screen for LOS prediction
Atalay[45] 2008 V	Critically ill elderly receiving parenteral and enteral nutrition	Retrospective, descriptive cohort (N = 119)	SGA did not predict mortality; no difference in mortality incidence (%) between well-(43%). moderately-(48.5%). and mal-(42.9%) nourished patients (P = .86)	SGA ability to predict mortality; mortality rates high in all categories of nutrition status
Sungurtekin[46] 2008/9 V	Medical and surgical critically ill	Descriptive cohort (N = 124)	SGA correlated with APACHE II (P = .000) and SAPS II (P = .001) scores and mortality (P = .001)	SGA predicts ability to predict morbidity and mortality in the critically ill
Ozkalkanli[39] 2009 V	Orthopedic surgery patients	Descriptive cohort (N = 256)	NRS 2002 predicted complications (OR 4.1; CI, 2.0-8.5); SGA predicted complications (OR 3.5; CI, 1.7-7.1)	Ability of NRS 2002 and SGA to predict postoperative complications

APACHE II, Acute Physiology and Chronic Health Evaluation II; CI, 95% confidence interval; LOS, length of stay; MI, Maastricht Index; MNA, Mini Nutritional Assessment; NRI, Nutritional Risk Index; NRS 2002, Nutrition Risk Screening 2002; OR, odds ratio; SAPS II, Simplified Acute Physiology Score II; SGA, Subjective Global Assessment.

Table 7. Nutrition Intervention, Nutrition Screening/Assessment, and Outcome

Study	Population	Study Groups	Results	Comments
Odelli[48] 2005 IV	Esophageal cancer undergoing chemoradiation	Prenutrition pathway (historical control) (n = 24); nutrition pathway (n = 24)	Less weight loss ($P = .03$), greater radiotherapy completion rates ($P = .001$), and fewer unplanned hospital admissions ($P = .04$) in nutrition pathway patients than in historic controls	Nutrition pathway treatment based on level of nutrition risk: low risk (preventative advice), moderate risk (oral nutrition support), and high risk (enteral nutrition)
Kruizenga[23] 2005 III	Mixed medical and surgical acute care	Screened (early treatment) (n = 297) and comparable control group unscreened (standard care) (n = 291)	Decreased LOS in screened (treated) group vs control with low hand grip scores (9.5 days vs 13 days, $P = .02$); no difference between total screened group vs control	SNAQ with early nutrition treatment in high-risk patients vs standard facility protocol (control) ability to reduce LOS
Persson[49] 2007 II	Elderly acute care	Nutritionally at-risk cohort randomized to treatment with dietary counseling, liquid and vitamin supplement (n = 29), or control (n = 25)	Weight maintained and activities of daily living ($P < .001$) improved in treated patients	At-risk patients determined by the MNA-SF randomly assigned to treatment or control
Babineau[50] 2008 V	Elderly subacute care	Malnourished or at nutrition risk cohort (n = 62) assessed by a dietitian for a nutrition care plan	Energy and protein intakes increased; 7 of 8 quality of life dimensions improved over study period ($P < .05$)	At-risk patients by nutrition screen followed up by dietitian assessment; care plan and follow-up
Norman [51] 2008 II	Post–acute care admission with benign gastrointestinal disease	Malnourished patients randomized to oral nutrition supplements and dietary counseling (n = 38) or dietary counseling alone (n = 42)	Hand-grip strength improved ($P < .0001$)) in supplemented group; counseling-alone group had more readmissions ($P = .041$)	Malnutrition determined by SGA; normally nourished did not qualify for the study

LOS, length of stay; MNA-SF, Mini Nutritional Assessment-Short Form; SNAQ, Short Nutrition Assessment Questionnaire; SGA, Subjective Global Assessment.

plications, and mortality. Nutrition screening is the first step in nutrition care. In varied adult populations, patients who are identified as malnourished by various screening tools have longer length of hospital stay,[33,34,36,37] and complications.[23,35-40] Mortality risk is also predicted by malnutrition screening (Table 5).[36,39,41]

2. Nutrition assessment is suggested for all patients who are identified to be at nutrition risk by nutrition screening: Grade E

Rationale. Malnourished patients, identified by nutrition assessment tools, have more complications and longer hospitalizations than do patients with optimal nutrition status. Such patients, identified by nutrition assessment tools, have more infectious and noninfectious complications,[16,39] longer hospital length of stay,[33,42,44] and greater mortality.[42,46,47] With one exception,[46] studies have shown malnourished patients to have greater mortality (Table 6).

3. Nutrition support intervention is recommended for patients identified by screening and assessment as at risk for malnutrition or malnourished: Grade C

Rationale. Nutrition support intervention in patients identified by screening and assessment as at risk for malnutrition or malnourished may improve clinical outcomes. This guideline places nutrition assessment and screening in the context of intervention as part of nutrition care.[23,48-51] 23, 48-51 Nutrition intervention in malnourished patients was associated with improved nutrition status,[48,49] nutrient intake,[50] physical function,[49,51] and quality of life.[51] In addition, hospital readmissions were reduced (Table 7).[48,51]

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