Nutrition survey in an elderly population following admission to a tertiary care hospital

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Abstract

Background: Malnutrition in elderly patients in institutions has become an issue of clinical concern, but it remains largely unrecognized in acute care hospitals. The demonstrated benefits of intervention emphasize the need for routine nutritional assessment. The objectives of this study were to determine the prevalence of malnutrition in elderly patients admitted to a tertiary care centre and to test the sensitivity and specificity of 3 nutrition screening tools.

Methods: Between July and November 1996 patients 65 years and older were consecutively recruited from the general medicine, orthopedics, general surgery and neurosciences services of The Ottawa Hospital — General Campus within 72 hours of admission. They were interviewed using 3 nutritional screening tools: one developed by Chandra and colleagues (Chandra), the Nutrition Screening Initiative (NSI) and the Mini Nutritional Assessment (MNA). A detailed nutrition assessment was then undertaken, which included anthropometric assessment, laboratory tests, determination of risk factors and assessment of dietary intake. A dietitian blinded to the screening results classified each patient as being well nourished, at risk for malnutrition or malnourished. The prevalence of malnutrition was assessed, and screening results were compared with the results of the detailed nutrition assessment for sensitivity and specificity.

Results: In total, 160 patients (86 women) were recruited. Detailed nutrition assessments were completed for 152 patients, of which 62 (40.8%) were found to be well nourished, 67 (44.1%) at moderate risk for malnutrition and 23 (15.1%) malnourished. Matched comparisons showed that, of the 23 malnourished patients, 1 was found to be at high risk for malnutrition using the Chandra screening tool, 9 using the NSI and 4 using the MNA, giving sensitivities of 32%, 54% and 57%, and specificities of 85%, 61% and 69%, respectively.

Interpretation: Given the high rate of malnutrition or risk of malnutrition in this study, admitting physicians need to be aware of this problem and its scope. The 3 screening tools tested performed poorly in comparison with the detailed nutrition assessment. This may have been because the score thresholds for the screening tools were set for screening purposes and because the screening tools were designed for different settings and a wider population.

Malnutrition in elderly patients in institutions has become an issue of clinical concern, yet it remains largely unrecognized in acute care hospitals.[1,2] In the acute care setting it has been linked with a wide range of increased complications.[3–9] In 2 previous studies malnutrition was found in 40% to 55% of elderly patients admitted to a tertiary care hospital, and severe malnutrition in 22% to 23% of all elderly patients assessed.[2,10] Nutritional interventions such as counselling, supplementation and enteral feeding have been shown to improve indicators of nutritional status.[11–14] The high prevalence and consequences of malnutrition in the elderly, together with the demonstrated benefits of intervention,[15–18] emphasize the need for routine nutrition assessment.

Nutrition assessment is a challenge because malnutrition is difficult to define. In a review of the literature Klein and associates[19] concluded that no gold standard exists for determining nutritional status. Therefore, a combination of indicators

Evidence

Études

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from several categories such as anthropometry, biochemical parameters, food intake and the presence of risk factors is recommended and has been used clinically to classify nutritional status.[20]

Detailed nutrition assessments are time-consuming and expensive and should thus target elderly patients at high risk for malnutrition. A simple, effective and easy-to-apply screening tool is essential to identify those at risk. In the last 15 years nutrition screening tools have been developed, tested and implemented.[21–25] Most were designed to screen elderly people in the community or in long-term care settings,[21–23] or focus on general surgical patients and not specifically on elderly patients.[24,25]

Chandra and colleagues[21] designed a 14-question screening tool for use by primary care physicians in Canada to assess the nutritional status of their elderly patients. The Nutrition Screening Initiative (NSI) is a similar screening tool for self-administration or administration by interview and takes 5 to 10 minutes to complete.[22] In both, weighted scoring is compared with a rating system to determine low, moderate or high risk for malnutrition. The Mini Nutritional Assessment (MNA),[23] with 18 weighted questions and a score for each question, was designed for administration by a trained health care practitioner. Because it can be used as an assessment tool as well as a screening tool, the total MNA score rates elderly patients as either well nourished or at risk for malnutrition rather than ranking by risk. The other screening tools reviewed were not designed specifically for assessing the nutritional status of elderly patients.[24,25]

Our objectives were to determine the prevalence of malnutrition among elderly patients admitted to a tertiary care hospital and to test the sensitivity and specificity of 3 screening tools in comparison with a detailed nutrition assessment, which we used as our clinical standard of nutritional evaluation.

Methods

Between July and November 1996 all patients 65 years of age and older admitted to the general medicine, orthopedics, general surgery and neuroscience services of The Ottawa Hospital — General Campus were consecutively recruited within 72 hours of admission. Exclusion criteria included cognitive impairment, language barrier, lack of family member or caregiver to answer the questionnaires, admission for acute palliation and refusal to provide consent. The research protocol was approved by the Ottawa Hospital Research Ethics Board.

A trained dietary research assistant screened admission lists on a daily basis, sought consent from eligible patients, and administered the Chandra screening tool, the NSI and then the MNA in a structured interview. A dietitian blinded to the screening results then performed a detailed nutrition assessment. Similar to assessments in previous studies,[26–31] our detailed nutrition assessment included chart review for height and weight, reported unintentional weight changes over the previous 3 months, total lymphocyte count, serum albumin level, total cholesterol level and the presence of risk factors for malnutrition,[29–31] specifically nausea, vomiting, diarrhea, constipation, difficulty chewing and history of gastrointestinal disease. If measurement of the serum albumin and total cholesterol levels was not part of the routine medical orders, written consent was obtained for these tests. Energy intake over a 24-hour period was calculated; if the patient or nurse reported that the day recorded was atypical, the count was repeated. Results were calculated on the CBORD Professional Diet Analyser (CBORD Group, Ithaca, NY) using the Canadian Nutrient File,[32] and the hospital's database. The percentage of estimated energy and protein needs consumed was calculated using the Harris Benedict Equation,[33] and an activity/stress factor of 1.3 for energy needs and a factor of 1.0 g of protein per kilogram body weight for protein needs.[34] Percent unintentional weight loss and body mass index were also calculated. Each criterion was scored according to a nutritional assessment grid that was derived from current clinical practice and from recommendations by Ham[20] and Laporte and colleagues.[26] Subjects were then classified according to the rating scores as well nourished, mildly malnourished or malnourished.

Frequencies of individual variables were determined and presented as percentage distributions. Results from each screening test were compared with the detailed nutrition assessment and analysed for sensitivity and specificity. The results were dichotomized in order to calculate sensitivity and specificity. Sensitivity of the screening tools was defined as the proportion of patients found to be at moderate or high risk for malnutrition compared with those found to be moderately or severely malnourished by the detailed nutrition assessment. Specificity was defined as the proportion of patients found not to be at risk for malnutrition compared with those who were not malnourished according to the detailed assessment. Kendall's tau was used as the measure of association for variables measured on an ordinal scale.

Table 1: Characteristics of 152 elderly patients admitted to a tertiary care hospital who underwent a detailed nutrition assessment

Characteristic	No. (and %) of patients
Sex	
Female	86 (56.6)
Age, yr	
65–69	33 (21.7)
70–79	88 (57.9)
80–89	26 (17.1)
≥ 90	5 (3.3)
Mean (and SD)	79 (14)
Range	65–93
Admitting service	
General medicine	54 (35.5)
Orthopedics	28 (18.4)
General surgery	30 (19.7)
Neurosciences	40 (26.3)
Diagnosis*	
Cerebral infarct, seizure or TIA	28 (18.4)
Fracture	33 (21.7)
Infection	28 (18.4)
Gastrointestinal hemorrhage or disorder	19 (12.5)
Obstructive airway disease or heart failure	10 (6.6)
Cancer	9 (5.9)
Other	18 (11.8)

Note: SD = standard deviation, TIA = transient ischemic attack.
*Data missing for 6 patients.

Results

During the 5-month study period 160 eligible patients were recruited. Eight subjects were not included in the analysis for the following reasons: 1 dropped out after giving consent, 2 were unable to complete the questionnaire because of deteriorating health, and 5 were discharged from hospital before the assessments could be completed. Baseline characteristics of the 152 subjects are presented in Table 1.

Of the 152 subjects who underwent a detailed nutrition assessment using the nutritional assessment grid (Table 2), 62 (40.8%) were found to be well nourished, 67 (44.1%) at moderate risk for malnutrition and 23 (15.1%) malnourished.

Using the Chandra screening tool we identified 1 patient (0.7%) as being at high risk for malnutrition and 37 (24.3%) at moderate risk (Table 3). Using the NSI we rated 64 patients (42.1%) at moderate risk and 9 (5.9%) at high risk. With the MNA we identified 4 (2.6%) as being malnourished and 66 (42.1%) at risk.

In comparison with the detailed nutrition assessment, the 1 patient who was identified by the Chandra screen as being at high risk for malnutrition was rated only mildly malnourished using the detailed assessment. Only 4 of the 9 patients that the NSI tool identified as being at high risk were malnourished. The 4 patients identified by the MNA as malnourished were also identified as such by the detailed assessment, but 19 patients found to be malnourished using the detailed assessment were not identified as such by the MNA. Given the small number of malnourished patients, patients at moderate and high risk were combined into one group to calculate the sensitivity and specificity of each tool. Thus, the sensitivities of the Chandra tool, the NSI and the MNA were 32.2%, 54.4% and 56.7%, and the specificities 85.5%, 61.3% and 69.4% respectively.

Interpretation

Of the 152 elderly patients admitted to the tertiary care

Table 2: Detailed nutrition assessment grid derived from current clinical practice[20,26]

	Score*				
Criteria assessed	1	2	3	4	5
Total lymphocyte count ($\times 10^9$/L)	> 1.5	1.2–1.5	< 1.2	–	–
Serum albumin level (g/L)	> 35	28–34	< 28	–	–
Total cholesterol level (mmol/L)	> 4.15	–	< 4.15	–	–
No. of risk factors: nausea, vomiting, diarrhea, constipation, difficulty chewing, history of gastrointestinal disease	≤ 1	2	≥ 3	–	–
% of energy intake needs	≥ 80	–	50–79	< 50	–
% unintentional weight loss over 3 months	0	–	1.0–7.5	–	> 7.5
Body mass index (kg/m^2)	24–29	20–23	< 20	–	–

*Total score of 7–11 = well nourished, 12–15 = mildly malnourished or at risk for malnutrition, and ≥ 16 = malnourished.

Table 3: Results of detailed nutrition assessment in comparison with 3 screening tools

Result	No. (and %) of patients	Sensitivity (and 95% CI)	Specificity (and 95% CI)
Detailed assessment			
Well nourished	62 (40.8)		
Moderate risk	67 (44.1)		
Malnourished	23 (15.1)		
Chandra nutrition screen[21]		32.2 (22.8–42.9)	85.5 (74.2–93.1)
Low risk	114 (75.0)		
Moderate risk	37 (24.3)		
High risk	1 (0.7)		
Nutrition Screening Initiative[22]		54.4 (43.6–65.0)	61.3 (48.1–73.4)
Low risk	79 (52.0)		
Moderate risk	64 (42.1)		
High risk	9 (5.9)		
Mini Nutritional Assessment[23]		56.7 (45.8–67.1)	69.4 (56.3–80.4)
Well nourished	82 (53.9)		
At risk	66 (43.4)		
Malnourished	4 (2.6)		

Note: CI = confidence interval.

centre 90 (59%) were found to have malnutrition or to be at risk for malnutrition. This high rate is consistent with that found in the literature, including the study by Mowé and Bøhmer,[10] but it is greater than that found by McWhirter and Pennington.[2]

There is no clinical standard for the diagnosis of malnutrition.[19] A detailed assessment is therefore the most logical clinical standard that is currently used. In comparison with the detailed clinical assessment used in our study, the 3 screening tools performed poorly, not identifying at least 19 clinically malnourished patients as being at high risk. Even when testing the screening tools for their ability to distinguish mild, moderate or severe malnutrition, sensitivities of 32% to 57% are far below the 80% sensitivity needed for a screening tool to be useful.

The Chandra screening tool and the NSI are similar in their development and primary functions. Nevertheless, with a sensitivity of 32%, the Chandra tool performed worse than the NSI, probably because of the rating system. With the NSI a person who has a score of 6 or more is rated as being at high risk for malnutrition, whereas with the Chandra tool a person who has a score of 5 is rated as being at moderate risk and a score of 10 or more at high risk. Therefore, of the 152 patients, only 1 was ranked at high risk with the Chandra tool.

The results of our evaluation of the NSI, which show that it has limited effectiveness as a screening tool in a tertiary care setting, are consistent with recent studies by MacLellan[35] and Rush.[36] The NSI was developed for use by primary care physicians,[37,38] primarily to increase awareness of risk factors for malnutrition.

We expected the MNA to identify more precisely patients with malnutrition or at risk for malnutrition because it was designed for an institutional setting (albeit long-term care) and is more detailed. Nevertheless, its sensitivity was only 57%, probably because of its scoring system, which gives less importance to unintentional weight loss, has too low a range of body mass index and does not incorporate laboratory data.

Further research in this area is necessary but challenging. All current assessment parameters are affected by illness and injury, and the effect of malnutrition is difficult to isolate from the influence of the disease on clinical outcome. In addition, data are lacking in terms of norms for the elderly population for anthropometric measurements, body composition, nutritional requirements[39] and laboratory data. Laporte and colleagues[26] examined a stepwise regression analysis of a detailed nutritional assessment. They found that the combination of percent weight loss, body mass index and serum albumin level was associated with an 80% prevalence of malnutrition among elderly people admitted for acute care. This approach warrants further investigation as a potential screening tool, as a step toward finding a validated screening tool to identify malnutrition or risk of malnutrition in the elderly population in acute care settings.

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