Minimizing False-Positive Nutrition Referrals Generated from the Malnutrition Screening Tool

THE JOINT COMMISSION SPECifies that each hospital "has defined criteria that identify when nutritional plans are developed" and assess their patients according to defined time frames.[1] The Academy of Nutrition and Dietetics (Academy) defines nutrition screening as the process of identifying characteristics known to be associated with nutrition problems, with a goal of identifying individuals who are malnourished or at nutritional risk and are in need of intervention and/or education from a registered dietitian nutritionist (RDN).[2] Many hospitals apply nutrition screening as part of the admission database process typically completed by registered nurses to determine patients requiring a referral to an RDN for a complete nutrition assessment and development of the nutrition care plan. An effective nutrition screening process is essential to help prioritize hospital resources, including RDN time, on patients at highest need for services.

A wide variety of nutrition screening questions are employed in hospitals in the United States based on patient population needs and/or multidisciplinary input at hospitals.[3] Several validated nutrition screening tools exist, and a majority of hospitals opt to use only one tool for all of their adult inpatient populations. Popular screening tools include the Malnutrition Screening Tool (MST),[4] the Malnutrition Universal Screening Tool (MUST),[5] and the Nutrition Risk Screening-2002 (NRS-2002).[6] The MST is described in detail in this article and is considered a "quick and easy" screening tool with two questions. The MUST and the NRS-2002 are considered comprehensive nutrition screening tools, with the MUST including a five-step screening tool with measures of disease severity, weight loss, and body mass index (BMI).[5] The NRS-2002 includes measurement of BMI, disease severity, weight loss, and dietary intake.[6]

Tools such as these are developed with a goal of predicting nutritional status or predicting poor clinical outcomes related to malnutrition. Due to a lack of a consistent definition of malnutrition or a gold standard against which to compare the validity of nutrition screening tools, most have been developed and validated with assessment by a clinician or using a standardized assessment tool as the reference method.[7] The chosen reference standard is assumed to be superior to the tool being validated. The Subjective Global Assessment (SGA),[8] developed in 1982 within a surgical population, is an assessment tool, is completely based on clinicians' evaluations, and is often regarded as the gold standard against which to compare other screening tools. Validity of the SGA was demonstrated by correlation of the clinical classifications in the tool with objective measurement of nutritional status and with three measures of hospital morbidity: incidence of infections, use of antibiotics, and length of stay (LOS).[8]

Ease of use is the main deciding factor for the choice of nutrition screening tool.[3] As discussed in a systematic review of nutrition screening tools in hospital settings in 2012,[7] there is no consensus on a single best nutrition screening or assessment tool to use for all categories of hospitalized patients. Several nutrition screening tools were evaluated by the Academy in 2009 for validity and reliability as part of their Evidence Analysis Library (EAL) process,[9] and this can be a helpful reference for clinicians.

As mentioned, the MST[4] is commonly used due to its simplicity and ability to be completed without additional calculations. The MST was validated using the SGA as the reference standard. The MST includes questions about an adult hospitalized patient's appetite and weight changes (see Table 1). Scores are allocated based on a patient's or caregiver's response to the questions. In cases where the patient responds "yes" to the question about losing weight without trying, then the nurse proceeds to the second question to ask the amount of weight lost. Points are assigned based on the total amount of weight lost. If the patient verbalizes having lost weight, but is unsure how much weight has been lost, he or she would be assigned 2 points. If the patient answers "no or unsure" to the first question, then the score for that section should be generated and the appetite question should be asked next. It is not necessary to ask or score the second weight loss question investigating the amount of weight lost in cases where the patient answers "no" or "unsure" to the first question. The weight loss and appetite scores are then totaled. In cases where a patient scores 2 or more points on the screening tool, he or she is considered at nutritional risk and a referral is sent to an RDN to complete a more in-depth assessment and to determine whether nutrition interventions are warranted. Patients who are uncertain whether they have lost weight recently, or know that they have lost weight but are unsure how much, are assigned 2 points (not 4 points, as may be misinterpreted from Table 1). Ferguson and colleagues,[4] authors of the MST tool, assigned a final value of 2 points to these patients because this had the highest sensitivity and specificity at predicting the score on the SGA. In other words, patients

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Table 1. Malnutrition Screening Tool

Malnutrition Screening Tool item	Score
Have you lost weight recently without trying?	
No	0
Unsure	2
If yes, how much weight (kilograms) have you lost?	
1-5	1
6-10	2
11-15	3
>15	4
Unsure	2
Have you been eating poorly because of a decreased appetite?	
No	0
Yes	1
Total	

who were unsure of weight loss were shown to be more likely to be either malnourished or at risk for malnutrition than those who had not lost weight.

The MST was evaluated in four cross-sectional studies for patients in acute-care hospital settings and ambulatory oncology centers.[4] The tool was determined to accurately identify patients at nutritional risk and in need of RDN assessment and intervention at least 93% of the time (ie, true positives). In addition, the MST accurately identified adequately nourished patients as not at risk (ie, true negatives) 93% of the time. These are measures of sensitivity and specificity, respectively. Other nutrition screening tools have higher specificity and sensitivity,[9] as described in the Academy's EAL, but these tools have either not been validated for use in acute-care hospital populations or are labor intensive to administer when compared with the MST.[9] Because nurses complete the nutrition screening tool in most acute-care hospitals, and have limited time to complete it, it is beneficial to use the tool that is quick and easy to administer. Of the 11 tools evaluated by the Academy's EAL workgroup,[9] the MST was shown in 2009 to be both valid and reliable for identifying nutrition problems in acute-care settings, and its simplicity and rapidity has allowed many hospitals to adopt this tool for malnutrition screening. The simplicity of the tool is verified by a high interrater reliability of 93% to 97%. The high interrater reliability indicates that most nurses will assign the same score to a patient regardless of which nurse is using the tool at that time.

Subsequent to the original validation of the MST in 1999 by Ferguson and colleagues[4] in a generalized hospital population and an ambulatory oncology population, it was compared for use in different populations. Amaral and colleagues[10] evaluated the MST in predicting outcomes and nutritional status in oncology inpatients in Portugal between March and June 2005. They compared the screening value of MST, MUST, and NRS-2002 in identifying patients at risk for malnutrition and to explore their ability to predict a high LOS. The NRS-2002 was chosen as the reference method instead of the SGA based on previous evidence that the NRS-2002 is a strong predictor of LOS and has shown the highest agreement with other screening and nutrition assessment tools in hospitalized patients. In the study by Amaral and colleagues,[10] patients were less likely to be identified as malnourished or at risk for malnutrition using the MST than they were when the MUST or NRS-2002 was used, and the MUST showed the most agreement with the chosen reference standard, the NRS-2002. Patients who were identified as malnourished using the MUST and NRS-2002 were more likely to have a longer LOS, but this effect was not seen when the MST was used. Because the NRS-2002 was used as the reference standard and, therefore, assumed to be the superior tool, failure of the MST to predict those with a longer LOS indicated that the MST was less likely to be predictive of malnutrition and therefore had a lower sensitivity. The results obtained by this group were likely different from the validation study by Ferguson and colleagues[4] due to a different patient population and a different reference standard.

In 2006, Neelemaat and colleagues[11] compared five nutrition screening tools, including the MST, on their ability to predict malnutrition in a generalized hospital population. The reference standard used was a classification of moderate or severe malnutrition based on the patient's BMI and degree of weight loss during the previous 6 months. The MST was shown to be 76% sensitive and 90% specific. Again, the difference in results from the original validation study are likely due to a different patient population and a different reference standard.

The MST was again compared for use in the inpatient oncology patient population between July 2011 and March 2013 in a hospital in London.[12] The reference standard this time was the Patient-Generated SGA, which is a modified version of the SGA. In this study, the MST had a sensitivity of 66% (95% CI 25 to 75) and a specificity of 83% (95% CI 86 to 98) for hospitalized oncology patients when compared against the reference standard of the Patient Generated-SGA. The positive predictive value was 91%, and the negative predictive value was 49%. This indicates that whereas most patients who were malnourished or at risk for malnutrition were identified correctly, a large number of false-positive patient referrals were also generated. The results of this study were similar to the study by Amaral and colleagues[10] in an inpatient oncology population, despite using a difference reference standard.

Consistent with the original validation study[4] and these studies,[10-12] MST identifies malnourished patients fairly quickly; however, also consistent with these studies, it generates false-positive referrals. In statistics, false positives are known as type 1 errors, which detect an effect that is not present, whereas a false negative fails to detect an effect that is present. A screening referral is classified as false positive in cases where the patient triggers positively on the nutrition screen, but the RDN did not identify a nutrition diagnosis and/or intervention for the patient upon completing a full nutrition assessment. A patient would be considered a false negative if he or she was at nutritional risk, yet the screening tool failed to identify him or her and the RDN was not alerted about this patient through the nutrition screening tool. Ferguson and colleagues[4] acknowledged that the false positives from the MST could be reduced by changing the cutoff value for identifying a patient as at risk for malnutrition as 3 points or more, but were concerned that this may increase false negatives such that patients who