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Nutrition Screening in Geriatric Rehabilitation: Criterion (Concurrent and Predictive) Validity of the Malnutrition Screening Tool and the Mini Nutritional Assessment—Short Form

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ABSTRACT

Background Nutrition screening is required for early identification and treatment of patients at risk for malnutrition so that clinical outcomes can be improved and health care costs reduced.

Objective To determine the criterion (concurrent and predictive) validity of the Malnutrition Screening Tool (MST) and Mini Nutritional Assessment—Short Form (MNA-SF) in older adults admitted to inpatient rehabilitation facilities.

Design Observational, prospective cohort.

Participants/setting Participants were 57 adults aged 65 years and older (mean±standard deviation age=79.1±7.3 years) from two rural rehabilitation units in New South Wales, Australia.

Main outcome measurements MST; MNA-SF; *International Statistical Classification of Diseases and Health Related Problems, 10th revision, Australian Modification* (ICD-10-AM) classification of malnutrition; rehospitalization; admission to a residential aged care facility (institutionalization); and discharge location.

Statistical analysis performed Measures of diagnostic accuracy with 95% CIs generated from a contingency table, Mann-Whitney *U* test, and χ^2 test.

Results When compared with the ICD-10-AM criteria, the MST showed stronger diagnostic accuracy (sensitivity 80.8%, specificity 67.7%) than the MNA-SF (sensitivity 100%, specificity 22.6%). Neither the MST nor the MNA-SF was able to predict rehospitalization, institutionalization, or discharge location.

Conclusions The MST showed good concurrent validity and can be considered an appropriate nutrition screening tool in geriatric rehabilitation. The MNA-SF may overestimate the risk of malnutrition in this population. The predictive validity could not be established for either screening tool.

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NUTRITION SCREENING IS REQUIRED FOR EARLY identification and treatment of patients at risk of protein-energy malnutrition (termed *malnutrition* throughout) and should occur routinely in all health care settings.[1] Nutrition screening tools are used to identify risk of malnutrition.[2] They should be quick and simple to implement and able to be used by any trained person or the patient themselves. Once risk is identified, a diagnosis of malnutrition should be made by a qualified health professional, such as a registered dietitian nutritionist, after a more comprehensive assessment of nutrition status.[3] It is critical that nutrition screening tools are validated for the population to which they are applied so that patient outcomes can be improved and resources are used efficaciously.[3]

Rehabilitation facilities are subacute health care facilities where patients are admitted when they require medical and multidisciplinary treatment with the purpose of increasing independence.[1] Rehabilitation patients typically have a chronic illness, such as chronic obstructive pulmonary disease or Parkinson's disease, or are recovering from an acute illness, such as a stroke or hip fracture. Because of the nature of rehabilitation facilities, the majority of patients are older adults. Malnutrition in older adults admitted to rehabilitation is associated with adverse clinical outcomes and mortality during admission,[4] and poorer quality of life and increased levels of physical dysfunction, hospitalization, institutionalization, and mortality once discharged to the community.[5,6] Older adults are often transferred to rehabilitation from acute-care facilities, where they might have developed malnutrition as a result of their

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illness or imposed treatments. Therefore, early and accurate identification of malnutrition risk when admitted to rehabilitation facilities is important for attaining a successful rehabilitation outcome and decreasing the economic burden of malnutrition in the older adult community.

Skipper and colleagues[7] have recently reviewed the nutrition screening tools that have been developed for identifying risk of malnutrition in a variety of settings, including the Malnutrition Screening Tool (MST).[8] The review concluded that the MST was the only nutrition screening tool of the 11 identified that was supported by studies espousing its validity and reliability. The MST has been widely adopted by health care facilities because of the low cost of implementation and low participation burden.[8] Since its development in acute-care patients, the MST has also been shown to be valid in oncology outpatients and more recently in residential aged care facilities.[8-10] In the rehabilitation setting, there are only two screening tools that have been evaluated for validity. These include the Mini Nutrition Assessment–Short Form (MNA-SF)[11] and the Rapid Screen.[12] The MNA-SF showed substantial agreement with the full MNA (κ=0.626; 95% CI 0.507 to 0.744)[13] and the Rapid Screen reported moderate sensitivity (78.6%) and excellent specificity (97.3%)[12] compared with a standardized nutrition assessment in geriatric rehabilitation. However, the MNA-SF has not been evaluated for its sensitivity or specificity, nor has it been evaluated using a benchmark unrelated to the MNA. The MST has not been evaluated in geriatric rehabilitation, despite being used frequently by practitioners. Therefore, the aim of this study was to determine the criterion (concurrent and predictive) validity of the MST and MNA-SF in older adults admitted to inpatient rehabilitation facilities.

MATERIALS AND METHODS

Study Sample

Participants were older adults admitted to one of two public rehabilitation units in the same local health district in rural New South Wales, Australia.[14] Study centers were chosen by convenience sampling based on location, and participants were consecutively sampled. Participants were English-speaking inpatients aged 65 years and older who were admitted to the participating rehabilitation units, community-dwelling residents before admission, if they were admitted with the expectation they would return to the community, and had an informal caregiver. This study was conducted as part of the MARRC (Malnutrition in the Australian Rural Rehabilitation Community) Study (Trial version 2.0, 9 May 2013), which has been registered at the Australian New Zealand Clinical Trials Registry (ACTRN12613000518763) and has received ethical and governance approval (North Coast NSW Human Research Ethics Committee: LNR 063, G108; School of Human Movement Studies Ethics Committee: HMS13/0731). Written informed consent was obtained from all participants and/or their guardians.

Data Collection

Data used in this observational, prospective cohort study were collected from August 2013 to February 2014. Participant characteristics and nutrition screening and assessment tools were all collected or completed on behalf of the participant by the primary researcher during an interview at the bedside (median of 2 days after admission) and were further supported by information from medical records, rehabilitation staff, or the patient's informal caregiver.

Nutrition Screening

The MST consists of two questions relating to recent unintentional weight loss and eating poorly, and was scored according to the Queensland Government's resource "Malnutrition. Is your patient at risk?"[15] A score of 2 or higher indicates the patient should be referred to a registered dietitian nutritionist to attend nutrition assessment and intervention, as appropriate.[8] Therefore, for the assessment of criterion validity, a score of 0 to 1 was used to indicate well-nourished and $\geq$2 was used to indicate risk of malnutrition. The MST was not completed as a separate tool for each participant, but rather a range of data was obtained during a full nutrition assessment, including the two MST questions, which were later used to complete the MST, a method reported by previous researchers.[16] Weight loss was considered in the 6 months leading up to the assessment.

The MNA-SF was completed as a separate tool. The MNA-SF consists of six questions and is scored 0 to 14, where a score of 0 to 7 indicates malnourished, 8 to 11 indicates at risk of malnutrition, and 12 to 14 indicates normal nutrition status.[17] For this study, an MNA-SF score of 12 to 14 was considered well-nourished and 0 to 11 was at risk of malnutrition.

Nutrition Assessment

There is no gold standard for diagnosing malnutrition. The *International Statistical Classification of Diseases and Health Related Problems, 10th revision, Australian Modification* (6th edition, ICD-10-AM)[18] criteria are the recognized standard diagnostic criteria for the identification, documentation, and coding of protein-energy malnutrition and are used to provide case-mix funding reimbursements (Figure). For this reason, the ICD-10-AM classification for malnutrition is an appropriate benchmark to establish the concurrent validity of a nutrition screening tool, and has been used as the standard against which nutrition screening and assessment tools have been validated.[19,20] The ICD-10-AM classification involves an evaluation of body mass index (BMI; calculated as kg/m^2) to detect chronic malnutrition (BMI $<$18.5) or weight loss with suboptimal dietary intake resulting in fat and/or muscle wasting to detect acute malnutrition. Failure to identify patients at risk of malnutrition in the health care setting can negatively impact funding[21]; therefore, the nutrition screening and assessment method used must be in agreement with the ICD-10-AM criteria to ensure resources are available for treatment. During nutrition assessment, the components of BMI, weight loss in the 6 months before assessment, a physical evaluation of fat stores and muscle status, and a brief dietary assessment were recorded and used to inform the ICD-10-AM classification of malnutrition for each participant. Any participant meeting the ICD-10-AM criteria of mild, moderate, or severe malnutrition (as per the Figure) was considered to have the condition malnutrition, and if they did not meet any ICD-10-AM criterion they were considered well-nourished.

Weight (kg) was measured to the first decimal point by Tanita InnerScan Body Composition Monitor scales model: