Review

A Systematic Review of Malnutrition Screening Tools for the Nursing Home Setting

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A B S T R A C T

Rationale: Malnutrition screening among nursing home residents is often performed with tools developed for use among older subjects, and sometimes with tools designed for an adult population. Only a few tools have been designed specifically for the nursing home setting. This systematic review assesses the criterion and predictive validity of malnutrition screening tools used in nursing homes.
Methods: The databases MEDLINE, CINAHL, and EMBASE were searched on January 30, 2013, for manuscripts including search terms for malnutrition, screening or assessment tools, and setting. Articles were eligible for inclusion if they expressed criterion validity (how well can a tool assess nutritional status) or predictive validity (how well can a tool predict clinical outcome) of malnutrition screening tools in a nursing home population. Included were articles that had been published in the English, German, French, Dutch, Spanish, or Portuguese language.
Results: The search yielded 8313 references. Of these, 24 met the inclusion criteria and were available; 2 extra manuscripts were retrieved by reference checking. Twenty tools were identified. Seventeen studies reported on criterion validity, and 9 on predictive validity. Four of the tools had been designed specifically for use in long term care. None of the tools, not even the ones specifically designed for the nursing home setting, performed (on average) better than "fair" in either assessing the residents' nutritional status or in predicting malnutrition-related outcomes.
Conclusion: The use of existing screening tools for the nursing home population carries limitations, as none performs better than "fair" in assessing nutritional status or in predicting outcome. Also, no superior tool can be pointed out. This systematic review implies that further considerations regarding malnutrition screening among nursing home residents are required.

Screening for malnutrition has received increasing attention over the past 2 decades. After 1982, when the Subjective Global Assessment (SGA) was introduced as the first screening tool for malnutrition, a few dozen screening tools have been developed. These tools are intended for the quick identification of patients at risk of malnutrition, for more in-depth nutritional assessment, or for identifying patients at risk of developing complications or even increased risk of mortality.

Malnutrition prevalence rates increase with age, due to factors such as multimorbidity, decreased appetite, diminished physical function, oral health, the ability to eat alone or with help, and/or cognitive decline. Depending on the method or parameters used for the nutritional assessment, prevalence rates of malnutrition among elderly subjects range between 6.5% and 85.0%.[1] For nursing home patients, the same ranges were recently described.[2,3]

Early identification of nursing home residents at nutritional risk, followed by adequate nutritional intervention, is expected to contribute to conservation of muscle function and muscle strength, and herewith to maintenance of independency, quality of life, and possibly prolonged survival.

Table 1
Cutoff Points Applied to Rate the Validity of the Screening Tools

	Good (g)	Good/Fair (g/f)	Fair (f)	Poor (p)	Unable to Rate (?)
Sensitivity/ specificity	se AND sp > 80%		se OR sp <80%, but both >50%	se OR sp < 50%	
AUC	>0.8		0.6—0.8	<0.6	
Correlation coefficient	>0.75		0.40—0.75	<0.40	
Kappa	>0.6		0.4—0.6	<0.4	
Odds ratio/ hazard ratio	>3		2—3	<2	
P value		P < .05 and n < 200*		>.05	P < .05 and n > 200†

AUC, area under the curve; se, sensitivity; sp, specificity.

*No indication of effect size.

†Significance of effect uncertain.

Of all malnutrition screening tools, a reasonable number have been developed for the elderly population, but only 4 were specifically developed and validated for use in long term care.[4–7] Consequently, nutrition risk screening among nursing home residents is usually performed using tools for the general (older) population.

In this article, we systematically review the validity of screening tools used among the nursing home population, both the "general" tools, and the tools specifically designed for use in the nursing home setting. The research questions focus on the criterion validity and predictive validity of tools.

Methods

A systematic literature search was performed to identify all relevant articles to the research questions. The bibliographic databases PubMed, EMBASE, and CINAHL (via EBSCO) were searched from inception until January 30, 2013. Search terms expressing "malnutrition" were used in combination with search terms comprising "screening or assessment tools" and terms for "nursing home setting." The references of the identified articles were searched for relevant publications.

Studies were included if they had been published in the English, French, German, Spanish, Portuguese, or Dutch language. The complete search strategy is depicted in Appendix 1.

Articles were included if they described (1) criterion validity (ie, the validity of a tool to screen or assess a resident's nutritional status, compared with a valid reference method) or (2) predictive validity (ie, the validity of a tool to predict outcome [infections, readmissions, mortality, poor discharge outcomes]).

As no gold standard for malnutrition exists, defining valid reference methods to rate the validity of a screening tool is challenging. By expert opinion, we decided to consider the following methods as "valid" reference methods:

- objective assessment by a professional
- nutritional assessment and anthropometry (ie, body weight [loss], body mass index [BMI], arm circumference)
- the assessment tools Mini-Nutritional Assessment (MNA) and SGA

Studies were excluded if they only described malnutrition prevalence rates, but not the validation of the tool, if they included fewer than 25 patients, if they focused on a specific disease or treatment (eg, AIDS or hemodialysis), or if the tools were adapted to the local situation (eg, the Taiwanese version of a tool).

Criterion validity is often expressed by sensitivity (se) and specificity (sp), area under the curve (AUC), correlation coefficients, and kappa values. Predictive validity is often expressed by odds ratios (ORs) and hazard ratios (HRs) or by P values.

To be able to rate the validity of the studied tools as good, good/fair, or poor, we applied cutoff points (Table 1). For correlation coefficients, we used the cutoff points described by Guilford.[8] For kappa values, we used the classification system described by Landis and Koch.[9] For sensitivity and specificity, no general cutoff points are mentioned in the literature; the optimal cutoff points highly depend on the clinical consequences. For the sake of transparency and clarity, we decided to indicate a sensitivity and specificity greater than 80% and an AUC of greater than 0.8 as good. Also, cutoff points for fair and poor performance were defined (Table 1). However, Tables 2 and 3 (the tables depicting the study data) give all the validity data, allowing the readers to form their own opinion if they do not agree with our proposed cutoff points. The cutoff points for OR and HR were chosen, based on the fact that a predictive ability with an OR/HR smaller than 2.0 will not have much practical value, the predictive ability with an OR between 2 and 3 implicates a moderate/fair effect, and the predictive effect of greater than 3 will be large. If authors published only P values we scored good/ fair when the sample size was smaller than 200. However, when the study had a large sample size, very small effects can become statistically significant, and the clinical significance can be doubted. We rated these as "unable to rate" (in tables depicted with a "?").

The PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement was followed as a guide for reporting.[10]

Results

Literature Search

The literature search yielded, after de-duplication, 8313 references (Figure 1).

Two reviewers were independently responsible for the selection of the articles for inclusion. First, all titles and abstracts, blinded for author, journal, and year, were screened for selection. This resulted in 44 articles to be retrieved full text; 2 of those could not be found. The remaining 42 articles were read full text, resulting in exclusion of another 18. The remaining 24 articles were included in this systematic review. Two articles were included from checking the reference lists of relevant articles and review articles, totaling 26 references.

During the selection process, all differences in judgment were resolved by consensus.

Tools

Twenty tools were identified. Criterion validity was described for all 20 tools, in 17 articles. Predictive validity was described for 8 tools, in 9 articles. Some tools were used for both purposes.

In this section, we describe the validity of tools, distinguishing between criterion validity (Table 2) and predictive validity (Table 3). We (in alphabetical order) first describe the tools that were originally developed for the nursing home setting, then the tools developed for the older population, and finally the tools that were developed for the adult population. For each tool, we briefly describe how the tool was developed (with which purpose, in which population), because this may be illustrative for the performance of the tool. Following the description of a tool, we describe how the tool performed in later studies with regard to the 2 research question in 2 subsections:

- how valid is a tool to assess a nursing home resident's nutritional status?
- how valid is a tool to predict a nursing home resident's clinical outcome?