Review

An analytic appraisal of nutrition screening tools supported by original data with particular reference to age

Marinos Elia M.D., B.Sc.Hon., F.R.C.P. *, Rebecca J. Stratton Ph.D., R.D., R.Nutr.

Institute of Human Nutrition, University of Southampton and University of Southampton NHS Hospitals Trust, Southampton, United Kingdom

A B S T R A C T

Objective: Controversies exist as to the suitability of various nutrition screening tools for various age groups, the incorporation of age and age-related criteria into some tools, and the procedures associated with tool selection.
Methods: Reviews of the literature and national and local datasets were used to identify the types of screening tools available for different age groups, the origins of age-related criteria, and the value of tool selection procedures based on predicting clinical outcomes.
Results: Nutrition screening can be undertaken in fetuses, children, and adults over narrow or wide age ranges, for diagnostic or prognostic purposes, with or without nutritional interventions. Certain tools can establish malnutrition risk without using any nutritional criteria, whereas others can do so only with nutritional criteria. The incorporation of age and age-specific body mass index criteria into adult screening tools can influence the prevalence and age distribution of malnutrition, but no justification is usually provided for their use. In several circumstances, age alone can predict mortality and length of hospital stay much better than screening tools. We identified various methodologic problems in nutrition screening tool selection.
Conclusions: A comparison of nutrition screening tools designed for different age groups and different purposes can be problematic. Age and screening tools incorporating risk factors that are non-modifiable or generally weakly modifiable by nutritional support (e.g., age, disease severity) may predict outcomes of disease, but they are not necessarily suitable for predicting outcomes of nutritional support. To contextualize the findings, a framework for screening tool selection is suggested that takes into account a matrix of needs.

© 2012 Elsevier Inc. All rights reserved.

Introduction

Screening in general can fulfill at least two roles. First, it may be helpful in identifying or predicting the risk of developing a condition and the features associated with it, such as complications, including death, resource use, and cost. Even if little can be done to prevent or treat the condition or its complications, such information may allow affected individuals and their families to put their affairs in order and to plan their futures. The information may also help health care providers or planners to allocate resources to manage the condition and insurers to design life insurance policies. Second, screening may identify individuals who are and are not likely to benefit from treatment, an issue of obvious clinical importance.

Nutrition screening tools are diverse instruments designed for use by various health care workers or members of the public (self-screening) in one or more care settings, one or more disease categories, and one or more age groups. They have also been designed to address distinct aspects of the two roles outlined earlier. Many nutrition screening tools were originally developed as diagnostic instruments (tools) for the purpose of detecting malnutrition, whereas others were developed as prognostic instruments for the purpose of predicting clinical outcomes or health care use [1]. For example, the Mini Nutritional Assessment (MNA) [2] was developed as a diagnostic instrument to establish nutritional status in the form of malnutrition rather than obesity in older (≥65 y) rather than younger people and in various care settings rather than in a single setting. Another tool, the Malnutrition Universal Screening Tool (MUST) [3], was developed to establish the need for nutritional support after establishing nutritional status, including obesity, in adults of all ages in all care settings. The Subjective Global Assessment (SGA) [4]

was developed as a prognostic instrument (to predict clinical outcomes such as complications of disease) rather than as a diagnostic instrument, using data from observational rather than interventional studies. Similarly, the Prognostic Nutritional Index of Buzby et al. [5,6] and the Geriatric Nutritional Risk Index [7], which incorporate blood results (circulating albumin concentration), were also originally designed as prognostic instruments using data from observational studies. Comprehensive reviews on nutrition screening [8–11] include instruments that incorporate blood tests. However, many workers have pointed out the limitations of such instruments, especially in settings where blood tests are not routinely undertaken and where there is substantial delay before analysis and reporting. Conversely, this may not be a problem in clinical settings, where routine blood tests are undertaken and quickly reported on an electronic system together with other results of nutrition screening.

The tool by Wolinsky et al. [12] was primarily developed to predict health care use in older people living in the community. In contrast, the Nutritional Risk Screening–2002 (NRS-2002) [12] was developed with the aim of predicting outcomes of interventions in hospitalized patients, an important issue that is discussed later.

Given the diverse nature of nutrition screening tools, it is not surprising that they incorporate different criteria and/or apply different weightings to the same criteria. For example, the SGA, which has been described as a tool that measures "sickness" as much as nutritional status, incorporates disease stress factors and clinical manifestations of disease, e.g., ascites [13,14], which are not included in other screening tools. Certain tools can establish a malnutrition risk category without any contribution from nutritional indices, such as measurements of thinness, weight loss, and/or dietary intake. Indeed, it may be difficult for some tools to establish a malnutrition risk using only nutritional criteria, e.g., using the tool by Elmore et al. [15], which is dominated non-nutritional criteria, such as type of disease, disease severity, previous hospitalization, domicile, and age. In contrast, other nutrition screening tools can only establish a malnutrition risk category using the nutritional indices described earlier [3, 16–18] and certain tools can do both depending on the patient (e.g., [19–21]). Figure 1 suggests that the selection process should be based not only on the quality of the tool, including evidence-based criteria such as validity and reliability, but also on the matrix of needs and potential applications of the tool, some of which are used for one setting and one condition, whereas others are used for all care settings and all types of conditions. One of the important considerations concerns age. This is not only because nutrition screening can be undertaken at any age, from before birth to shortly before death, but also because some tools were developed for application over a narrow age range, whereas others were designed for use over a wide age range, sometimes spanning almost the entire age range of adults and children. However, because there have been some controversies about the choice of screening tools for specific age groups and controversies about the incorporation of age-related criteria into some of them, these issues are reviewed here, especially because they have not been critically evaluated in previous reviews [1,8–11,22–25].

Although nutrition screening tools are helpful in addressing diverse needs and have diverse applications, in clinical practice, the response to nutritional support is valued most highly [22,26]. Unfortunately, there is insufficient evidence to rank nutrition screening tools according to their ability to predict outcomes of nutritional interventions. There is concern about poor agreement between them, which suggests a risk that patients requiring nutritional support may not get it and vice versa. Most nutrition intervention studies have not used the commonly cited tools [26], no head-to-head randomized controlled trials have been undertaken, and there have been no indirect comparisons using a common denominator. In the absence of such information, clinical workers have made recommendations to the clinical community about the choice of nutrition screening tool for routine clinical practice based on their ability to predict outcomes in the absence of any specific nutritional interventions. Such studies, which are discussed later, have typically involved comparisons of commonly used or cited adult screening tools, such as the SGA, MNA, NRS-2002, and MUST; and they have involved tools with and without age components, tools designed for use in different age ranges, and tools with different body mass index (BMI) cutoff values.

Scope of the review

This review on nutrition screening aims to examine three age-related issues by:

1. identifying the spectrum of tools available for different age groups, pinpointing adult screening tools that incorporate age into their scoring systems, and examining any scientific rationale that is provided for incorporating age into such tools
2. assessing the effect of age alone in predicting clinically relevant outcomes, comparing it with the ability of nutrition screening tools to predict the same outcomes, and systematically examining methodologic issues that can influence predictive validity
3. evaluating the scientific basis and implications of incorporating different BMI thresholds for underweight into screening tools from clinical and public health perspectives.

By fulfilling these aims, we hope to achieve a better understanding of the merits and limitations of using age and different BMI cutoff values in various screening tools. The amalgamated information should help clinicians understand the clinical implications of using different screening tools, because there is no malnutrition screening tool "gold" standard and a lack of comparative data to otherwise guide them. Figure 1, which illustrates issues that need to be considered in screening tool selection, is used to put the findings into perspective.

It is beyond the scope of this review to comprehensively examine all screening tools, of which there are probably several hundred, mostly unpublished tools. We also do not aim to examine all the characteristics of screening tools, such as their acceptability by staff and patients, their reproducibility, and all aspects of their validity. The reader is referred to other reviews for a discussion of these issues [1,8–11,22–25]. The effect of nutritional support on clinical outcomes in malnourished and non-malnourished subjects identified in different ways can also be found elsewhere [22,26].

Much of the recent literature comparing screening tools has involved commonly used (MNA, NRS-2002, MUST) or cited (SGA) tools, which provide by far the richest source of information for examining certain age-related issues, such as the prediction of clinical outcomes in the absence of nutritional support. To facilitate an understanding of the issues involved, the Appendix summarizes the background to the SGA, MNA, NRS-2002, and MUST and describes their scoring systems. However, a wide range of other screening tools, whose histories are not given in