



Basic nutritional investigation

## Evaluation of nutritional screening tools for patients scheduled for cardiac surgery

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### ABSTRACT

**Objective:** The aim of this study was to assess the prognostic value of different nutritional screening tools in patients undergoing cardiopulmonary bypass with regard to an adverse clinical course.

**Methods:** This prospective cohort study analyzed 894 adult patients who underwent cardiopulmonary bypass. Patients were screened using four nutritional screening tools: Nutritional Risk Screening 2002 (NRS-2002), the Malnutrition Universal Screening Tool (MUST), the Mini-Nutritional Assessment (MNA), and the Short Nutritional Assessment Questionnaire (SNAQ). Nutritional status was assessed using the Subjective Global Assessment. In-hospital mortality, postoperative complications, length of stay in the intensive care unit, and length of hospitalization were analyzed.

**Results:** The sensitivities of the SNAQ, MUST, and NRS-2002 to detect the malnutrition confirmed by the Subjective Global Assessment were 91.5%, 97.9%, and 38.3%, respectively, and the MNA showed a sensitivity of 81.8% for the elderly. Malnutrition detected by the SNAQ, MUST, and NRS-2002 was associated with postoperative complications (odds ratios [ORs] 1.75, 1.98, and 1.82, respectively) and a stay in the intensive care unit longer than 2 d (ORs 1.46, 1.56, and 2.8). Malnutrition as detected by the SNAQ and MUST was also associated with prolonged hospitalization (ORs 1.49 and 1.59). According to multivariate logistic regression analysis, postoperative complications were independently predicted by the European System for Cardiac Operative Risk Evaluation (OR 1.1,  $P < 0.0001$ ), cardiopulmonary bypass time (OR 1.01,  $P < 0.0001$ ), and malnutrition identified by the MUST (OR 1.2,  $P = 0.01$ ).

**Conclusion:** The MUST independently predicts postoperative complications. The SNAQ and MUST have comparable accuracy in detecting malnutrition. Whether preoperative nutritional therapy would improve the outcome in malnourished patients needs to be studied.

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### Introduction

The screening of nutritional status is a necessary aspect of good nutritional practice [1]. Because different pathologies lead to malnutrition, different tools have been developed for nutritional screening. European guidelines [2] recommend the Malnutrition Universal Screening Tool (MUST) [3] for the nutritional evaluation of adults in the community, Nutritional Risk Screening 2002 (NRS-2002) [4] for the detection of

undernutrition and the risk of its development in hospital settings, and the Mini-Nutritional Assessment (MNA) [5] for elderly patients in home-care programs, nursing homes, and hospitals. The Short Nutrition Assessment Questionnaire (SNAQ) was developed specifically for the hospital outpatient population [6]. The Subjective Global Assessment (SGA) yields results that are tightly correlated with other objective methods of assessment of nutritional status and has prognostic value with regard to infectious complications [4]. However, applying the SGA is more appropriate for an assessment of nutritional status rather than nutritional screening.

Malnutrition is widespread in patients with cardiovascular diseases and is related to adverse postoperative outcomes.

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**Table 1**  
Composition of nutritional screening tools

Screening tool	Parameter	Score	Total score interpretation
SNAQ [6]	Did the patient lose weight unintentionally?		2 = moderate malnutrition, 3 = severe malnutrition
	>6 kg in previous 6 mo	3	
	>3 kg in previous 3 mo	2	
	Did the patient show a decreased appetite over the previous month?		
	Yes	1	
MUST [3]	Did the patient use supplemental drinks or tube feeding during the previous month?		1 = medium risk of malnutrition, ≥2 = high risk of malnutrition
	Yes	1	
	BMI (kg/m <sup>2</sup> )		
	18.5–20	1	
	≤18.5	2	
NRS-2002 [4]	Weight loss in 3–6 mo		≥3 = malnutrition
	5–10%	1	
	≥10%	2	
	Acute disease effect		
	Lack of nutritional intake >5 d	2	
	Nutrition		
	Weight loss >5% in 3 mo or food intake 50–75% of normal requirements in preceding week	1	
	Weight loss >5% in 2 mo, BMI 18.5–20.5 kg/m <sup>2</sup> and diminished general condition, or food intake 25–60% of normal in preceding week	2	
	Weight loss >5% in 1 mo or >15% in 3 mo, BMI <18.5 kg/m <sup>2</sup> and diminished general condition, or food intake 0–25% of normal in preceding week	3	
	Severity of disease		
MNA [5]	Patients with chronic disease and acute complications, including cirrhosis, chronic obstructive pulmonary disease, chronic hemodialysis, diabetes, and oncology	1	8–10 = at risk of malnutrition, ≤7 = malnutrition
	Stroke	2	
	Intensive care patients with APACHE score >10	3	
	Age >70 y	1	
	Has food intake decreased over the previous 3 mo due to loss of appetite, digestive problems, or chewing or swallowing difficulties?		
	Severe decrease in food intake	0	
	Moderate decrease in food intake	1	
	No decrease in food intake	2	
	Weight loss during previous 3 mo		
	>3 kg	0	
	Not known	1	
	1–3 kg	2	
	No weight loss	3	
	Mobility		
	Bed- or chair-bound	0	
Able to get out of bed/chair but does not go out	1		
Goes out	2		
Has the patient experienced psychological stress or acute disease in the previous 3 mo?			
Yes	0		
No	2		
Neuropsychological problems			
Severe dementia or depression	0		
Mild dementia	1		
No psychological problems	2		
BMI (kg/m <sup>2</sup> )			
<19	0		
19–21	1		
21–23	2		
≥23	3		

APACHE, Acute Physiology and Chronic Health Evaluation; BMI, body mass index; MNA, Mini-Nutritional Assessment; MUST, Malnutrition Universal Screening Tool; NRS-2002, Nutritional Risk Screening 2002; SNAQ, Short Nutritional Assessment Questionnaire

Furthermore, malnutrition occurs in approximately 10% to 25% of patients undergoing cardiac surgery [7]. However, despite the identification of specific mechanisms of development of malnutrition in patients with congestive heart failure leading to cardiac cachexia [8], a specific tool for nutritional screening in this population has not been designed. Furthermore, the lack of a comparative analysis of different screening tools in patients with cardiac disease leaves clinicians without guidance in selecting the most effective approach. The aim of this study was to assess the prognostic value of four different nutritional screening tools (MUST, NRS-2002, SNAQ, and MNA) with regard

to adverse outcome in patients with cardiac disease undergoing cardiopulmonary bypass (CPB).

#### Materials and methods

This prospective cohort study was approved by the local hospital ethics committee. The inclusion criteria were an age older than 18 y and scheduled cardiothoracic surgery with CPB. The exclusion criteria were emergency surgery, pulmonary thromboembolism, and aortic dissection. We obtained informed consent from 909 adult patients hospitalized from January 1, 2011 through August 31, 2011 and included them in the study. The patients were assessed in the preoperative period within 48 h of admission to the hospital. All patients

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