Methods to evaluate the nutrition risk in hospitalized patients

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Abstract

The rate of malnutrition is substantially high both in the population and in chronic patients hospitalized because of different reasons. The rate of patients with no marked malnutrition at the time of hospitalization who develop malnutrition during hospitalization is also substantially high. Therefore, there are currently different screening methods with different targets to prevent malnutrition and its overlook. These methods should be simple and reliable and should not be time-consuming in order to be used in daily practice. Seven nutrition risk screening methods used in children have been established until the present time. However, no consensus has been made on any method as in adults. It should be accepted that interrogation of nutrition is a part of normal examination to increase awareness on this issue and to draw attention to this issue.

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Key words: Nutrition risk, child, malnutrition, screening

Currently, malnutrition or causes leading to malnutrition still constitute 1/3 of the mortality in young children below the age of 5 years (1). The rate of malnutrition is also at a nonnegligible level in patients who are hospitalized because of different causes (2-4). In addition, there are also patients who have no prominent malnutrition at the time of hospitalization, but who develop malnutrition during hospitalization and this has been reported with a rate of 20-50% (5-9). Therefore, malnutrition continues to be a significant health problem also at the present time.

Evaluation of the nutritional status of each patient examined should be routinized and accepted as a part of examination to prevent missing of malnutrition. With this objective different screening methods with differ-

ent targets have been developed (10, 11). The method to be applied should not be time-consuming and should be simple, easily understandable and reliable and applicable for a wide disease group. It should be sensitive and specific and determine patients with moderate and severe malnutrition for the required support to be provided.

Screening methods

Although asking two simple questions is frequently enough to evaluate the nutrition risk in hospitalized adults, the screening methods in children are generally substantially complex. Therefore, they are not widely used in daily practice. New screening methods are being developed continuously for the aim of simplification. Seven screening methods have been developed until the present time for use in children.

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These screening methods include: 1) Nutritional Risk Score (NRS) (12), 2) Pediatric Nutritional Risk Score (PNRS) (7), 3) Subjective Global Nutritional Assessment (SGNA) (13), 4) Screening Tool for the Assessment of Malnutrition in Pediatrics (STAMP) (14), 5) Pediatric Yorkhill Malnutrition Score (PYMS) (15), 6) Screening Tool for Risk of Impaired Nutritional Status and Growth (STRON-kids) (16), 7) Pediatric Nutrition Screening Tool (PNST) (17).

Properties of the screening methods

SGNA, PYMS and STRONGkids, PNST screening tools were established according to previously present rules and principles (18) and NRS was established in comparison with the Nutritional Risk Index (NRI) (19) established for adults. PNRS and STAMP attained their final forms after multivariate analysis of structured questionnaires which defined many factors predicting nutritional risk. The objective of these screening tools is to calculate the nutritional risk in hospitalized patients and the requirement of nutritional support during hospitalization.

A reduction of 2% in weight in Pediatric Nutritional Risk Score (PNRS) developed by Sermet-Gaydelus et al. (7) at the 48th hour after hospitalization was accepted as nutritional risk. In the study in which reduction in intake of food, the ability to take food and findings (pain, dyspnea, depression) were evaluated, a 50% reduction in food intake and pain were assessed with one score and the present disease status was assessed with 1-3 scores according to severity. Patients with hepatic, cardiac and renal disease were excluded considering excessive fluid loss. Accordingly, the nutritional risk was graded between 0 and 5 and a score of 1-2 was considered moderate risk and a score of >3 was considered high risk.

At the end of the study, a reduction of more than 2% in weight was observed in the subjects who had 50% reduction in food intake, pain and stage 2-3 disease. The positive predictive value of the study was calculated to be 67%.

Subjective Global Nutritional Assessment (SGNA) was applied to surgery patients by Secker and Jeejeebhoy (13) and the patients were followed up for 30 days after surgery. In the study which also included antropometric measurements and biochemical investigations, the height and weight of the patients, the heights of the

parents, food intake, the frequency and time of the findings related with the digestive system, the functional status of the patients during examination and changes which occurred recently were evaluated and the patients were divided into three groups as well-fed, moderately-fed and poorly-fed. When the complications related with nutrition were examined at the end of 30 days, it was observed that complications related with infection occurred more frequently in children with malnutrition and these children were hospitalized longer.

In the Screening Tool for the Assessment of Malnutrition in Pediatrics (STAMP) method, the clinical status, nutritional state and antropometric measurements are used. Reduction in the height for age, weight loss, increased interval between weight and height percentiles and change in appetite are interrogated and an interpretation such as nutritional risk is present or absent is made. The status during the follow-up is not evaluated in this method (14). In the study, the sensitivity, specificity and positive predictive values were reported to be 72%, 90% and 55%, respectively.

In Pediatric Yorkhill Malnutrition Score (PYSM), body mass index, weight loss, change in food intake in the last one week and nutritonal status at the time of examination are interrogated (15). Each of these four variables are graded between 0 and 2 and risk staging is made according to the score obtained at the end. The sensitivity of the study was found to be 59% and the specificity and positive predictive value were found to be 92% and 47%, respectively.

In screening Tool for Risk of Impaired Nutritional status and Growth (STRONGkids) method, subjective and general assessment of the patient, presence of high-risk disease (Table 1), food intake and losses, weight loss or low weight gain are interrogated and the nutritional risk is scored between 0 and 5 (16). In the questionnaire where the first two questions are evaluated by a pediatrician and the final two questions are evaluated by a nurse/dietitian, stage 1-3 indicate moderate nutritional risk and stage 4-5 indicate high nutritional risk. When weight for height and height for weight below 2 standard deviation were considered acute and chronic malnutrition, respectively, a significant correlation was found between the high risk group and weight for height Z score in this screening method. Hospitalization times were also longer in the high-risk group.

Pediatric Nutrition Screening Tool (PNST) is the final application for which White et al. (17) simplified the questions and which interrogates involuntary weight loss in recent days, poor weight gain in the last few months, reduction in food intake in the last few weeks

Table 1. Disease group considered high-risk in the STRONG-kids method

Anorexia nervosa
Burns
Bronchopulmonary dysplasia
Celiac disease
Cystic fibrosis
Premature delivery
Chronic heart disease
Infectious diseases (AIDS)
Inflammatory bowel disease
Cancer
Chronic hepatic disease
Chronic renal disease
Pancreatitis
Short bowel syndrome
Muscle disease
Metabolic disease
Trauma
Mental retardation
Major surgical intervention
Other (stated by a physician)

and if the child is lean/obese. Presence of two positive responses indicates nutritional risk. Since there are no antropometric measurements, the application time is shortened to a much greater extent. When the subjects with a body mass index Z score below -2 standard deviation were considered, the sensitivity of the study was found to be 66.2% and the specificity was found to be 89.3%.

SGNA, STAMP, PYMS additionally give information about nutritional status and PNRS, PYMS, SRONGkids give information about how the clinical course would be when nutritional support is not given. Thus, it can be predicted if malnutrition will develop or not during hospitalization considering certain risk markers. Therefore, the patients who do not have acute or chronic malnutrition at the time of hospitalization should be evaluated further.

While screening can be completed at the end of 48 hours when PNRS method is used (7), evaluation with the other six methods can be realized directly at the time of admission (13-17, 20, 21). STAMPS, PYMS, STRONGkids and PNST can also be repeated weekly during long hospitalizations. The results of the studies in which nutritional risk screening methods were used are shown in Table 2.

When the nutritional status at the time of examination, weight loss, reduced intake and the severity of the disease status are evaluated according to ESPEN criteria, NRS, SGNA, PYMS, STRONGkids and PNST are appro-

Table 2. Properties of the studies in which nutritional risk screening methods were used

Method	Patient group	Age	Number of patients	High-risk group
NRS (12)	Non-surgical	0-17 years	26	-
PNRS (7)	Surgical+non-surgical	>1 month-18 years	296	>2% weight loss
SGNA (13)	Surgical	>1 month-18 years	175	Long hospitalization, ↑ infection, BMI SD ↓
STAMP (20)	Surgical+non-surgical	2-17 years	89	-
PYMS (21)	Surgical+non-surgical (cardiology, nephrology, orthopaedics, excluding critically ill patients)	1-16 years	247	↓ weight/height SD
STRONGkids (16)	Surgical+non-surgical	>1 month-18 years	424	Long hospitalization, ↓ weight/height SD
PNST (17)	Surgical+non-surgical	0-16 years	295	2 positive responses

NRS: Nutritional Risk Score; PNRS: Pediatric Nutritional Risk Score; SGNA: Subjective Global Nutritional Assessment; STAMP: Subjective Global nutritional assessment; PYMS: Pediatric Yorkhill Malnutrition Score; STRONGkids: Screening Tool for Risk of Impaired Nutritional status and Growth; PNST: Pediatric Nutrition Screening Tool; BMI: body mass index; SD: standard deviation

priate to evaluate all these criteris (12-14, 16, 20, 21). In assessment of the nutritional status, NRS, SGNA, STAMP and PYMS use antropometric measurements, whereas STRONG-kids and PNST utilize subjective clinical evaluation. SGNA additionally interrogates the motility of the digestive system, the parental height and functional capacity. PNRS also interrogates pain.

STAMP and PYMS were developed in such a way as to be applied by nurses. In STRONGkids, response should be received to two of four questions asked to the parents and both responses should be graded by a family practitioner or pediatrician. In the final study performed by Moeeni et al. (22), the authors showed that 90% of the subjects with malnutrition could be found by pediatricians and 84% of the subjects with malnutrition could be found by nurses when the questions in the STRONGkids method were simplified by converting them to the form of yes/no so that interrogation could be applied by nurses. Thus, STRONGkids is widely used by nurses and dieticians in clinical practice.

The methods of NRS, SGNA, STAMP and PYMS can give reliable results independent of the person applying the method (12-15, 20, 21). In the NRS method, all patients with moderate and high-degree malnutrition can be detected by nurses. In the PYMS group, 86% of the patients in the low or high risk groups can be detected (15, 21). In the methods of PNRS, STAMP, PYMS and STRONGkids, evaluation by a dietician or nutrition team and/or an individual trained in this area is recommended to detect the high-risk group.

Applicability

Evaluation lasts for 48 hours only in the PNRS method. Evaluation can be made rapidly at admission in the other six methods. In the study of Ling et al. (23), evaluation lasted for 10-15 minutes and 5 minutes, respectively, when STAMP and STRONGkids were applied to 43 patients. The difference between the two methods arises from the antropometric measurements performed in the STAMP method.

The applicability of the methods to the majority of the patient group is very important. While STRONGkids can be applied to 98% of the patient group, it has been reported that the STAMP method can be applied to 83.4% of the patient group. The difference between arises from the lack of height/weight measurements which are necessary for the STAMP method.

Comparison of the methods

When Ling et al. (23) compared the STAMP and STRONGkids methods on 43 children, they found that Strongkids was superior in risk classification. The nutritional risk ratio was found to be higher than it should be in the STAMP method.

Wiskin et al. (24) applied the methods of PNRS, SGNA, STAMP and STRONGkids to 46 patients who were being followed up with a diagnosis of inflammatory bowel disease and who needed to be hospitalized and compared the results with the antropometric measurements established for malnutrition by the World Health Organization. Conclusively, it was emphasized that there was no compatibility between these methods in terms of the tools used to determine the risk and the methods used to evaluate malnutrition, nutrition assessment methods did not gain clarity in chronic diseases and nutrition was disrupted in children with inflammatory bowel disease. In the study of Gerasimidis et al. (15) in which the SGNA, STAMP and PYMS methods were compared, it was observed that the sensitivity of PYMS was similar to STAMP, but the predictive value of PYMS was much higher than STAMP. In the same study, the specificity of SGNA was found to be higher compared to PYMS, but the sensitivity was lower. Thus, the authors interpreted that PYMS was more efficient in detecting children with nutritional risk and the rate of false-positivity was lower compared to STAMP. It was stated that the SGNA method gave different results, since it was an assessment method rather than being a screening method. In the study of Moeeni et al. (25) in which 119 Iranian children were examined and the STAMP, PYMS and STRONGkids methods were used, it was found that the results of the STRONGkids method were very compatible with the antropometric methods and the increase in the risk rates was very compatible with the hospitalization time. When the same study group used the STAMP, PYMS and STRONGkids methods on 162 New Zealander children, they emphasized that all three methods were helpful in detecting the nutritional risk, but the STRONGkids method was more reliable (26). Similarly, Cao et al. (27) stated that the scores of the STRONGkids method applied to 1325 hospitalized children were compatible with the clinical course.

Since there is no definite consensus on the definition of malnutrition, interpretation of these screening methods is highly controversial and no screening method

is the gold standard. A screening method should be reliable, applicable and assessable. When reliability of these screening methods are evaluated, the SGNA and STAMP methods are performed by dieticians and the NRS and PYMS methods are performed by nurses and dieticians. The most difficult situation arises in evaluation of the nutritional status at the time of presentation. In the STAMP and PYMS methods, the results are completely evaluated according to diets and they are emphasized to be gold standards, while not all countries have dieticians and the role of dieticians is not the same in all countries (1).

When the antropometric measurements were used to evaluate the nutritional status and the definition of the World Health Organization was used for malnutrition, significant differences were found in the number of children with malnutrition with mean standard deviation and/or different risk classification in the SGNA and STRONGkids methods. Since NRS, STAMP and PYMS use only weight and height, it is not reliable to differentiate standard deviation scores between the risk groups.

Conclusively, the STRONGkids method among all these methods seems to be more applicable, since it is a simple and convenient method and its reliability has been proven in a higher number of study groups compared to the other methods. However, there is still no nutritional risk method on which a consensus has been established as in adults. For this objective, studies with very large study groups comparing all these methods in every aspect should be performed. A project supported by ESPEN/ESPGHAN and conducted by Koletzko was initiated for this objective (11). The results of this study which will be conducted by 2400 pediatricians in 14 Pediatric Clinics in 12 countries in Europe and which will compare the STAMP, PYMS and STRONGkids methods will be useful in this aspect.

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