



# Implementation of STRONGkids in Identify Risk of Malnutrition in Government Hospital



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## Keywords

*Hospital Children; Malnutrition; Screening tool;*

## Abstract

Hospital malnutrition increase morbidity and mortality rate of hospitalized children, regardless of underlying diseases. This study evaluated the risk of malnutrition using STRONGkids screening tool in hospitalized children in government hospitals. An observational study was done in seven government hospitals in Bali, Indonesia. The STRONGkids score of consecutively hospitalized children was calculated and compared with the nutritional status, age, gender, and underlying diseases. Chi-Square and Logistic Regression test were done with considered significant if P value < 0.05. Total 129 children included this study. Fifty-six percent males, mean age 4.1<3.4 years, 20.3% had an underlying chronically diseases, 6.2% had severe malnutrition, and 25.6% had moderate malnutrition. Based on STRONGkids, 12.4% children were at high risk and 87.6% at moderate risk without at low risk for malnutrition. High risk for malnutrition was associated with chronically diseases (p= 0.020), severe and moderate malnutrition (p = 0.001 and p = 0.012, respectively). It can be concluded that the STRONGkids can be recommended in identify the risk of malnutrition in hospitalized children. Children with high or moderate risk for malnutrition need nutritional support such as high energy density oral supplementation.

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## 1. Introduction

Hospital malnutrition in children has a negative impact on prognosis of the underlying diseases. Most of them have been published such as longer length of hospital stay [1], high hospital cost [2], and higher mortality rates.[3] Therefore, hospital malnutrition should be managed to support better prognosis of the diseases.

The prevalence of hospital malnutrition was reported different among hospital. In many countries it was reported varies between 23% to 51.6%.[4] In Sanglah Hospital Bali, the prevalence of malnutrition in hospitalized decreased from 30.1% in 2008 to become 17% in 2012.[1,5] The decrease of it is caused by the oral or enteral nutritional support during hospitalized on each hospitalized children. High energy density (1 kcal/ml) formula is usually used to support the nutrition intake.

Recently is developed several screening tools to detect the risk of malnutrition in hospital. The screening tool, which has been used and published were Simple Pediatric Nutritional Risk Score (PNRS) [6], Subjective Global Nutritional Assessment for Children (SGNA) [7], and Screening Tool for Risk of Impaired Nutritional Status and Growth (STRONGkids).[8] The STRONGkids screening tool is easy and practical to be done and has been used in clinical practice with many setting in identifying the risk of hospital malnutrition.

The study objective is implementation the STRONGkids screening tool in identifying the risk of hospital malnutrition in many government hospitals and the association of it with nutritional status at admission, underlying diseases, age, and gender of the patients.

## 2. Research Method

The observational analytic cross-sectional study was done in children who hospitalized in several Government Hospital in Province of Bali, Indonesia. Data included patient's age, gender, diagnosis of the diseases, nutritional status based on weight-for-height, and a score of the STRONGkids were collected at the same time at admission. The study conducted in Pediatric Ward of Sanglah General Hospital (academic hospital) and other six Government Hospital (general hospital) around the Province of Bali, Indonesia during the period of July until September 2017.

Children were consecutively chosen as a sample if their age 1-18 years old and had complete data on medical record. They excluded from the study if they died on arrival at the hospital and needed ventilator assistant during hospitalized. The Ethical Commission of Udayana University – Sanglah General Hospital, Denpasar Bali, has approved this study.

STRONGkids is used in identifying the risk of hospital malnutrition in children aged 1 month until 18 years old. It consists of 4 questions with own score respectively. The complete question and score of STRONGkids can be shown in the reference number 8. The STRONGkids criteria for risk of malnutrition are low risk if score 0; moderate risk if the score is 1-3; and high risk if the score is 4-5.[8]

Nutritional status at admission was determined using WHO growth standard with weight-for-height criteria for severe, moderate, and well nourish were  $< -3SD$  Z-score, between  $-3SD$  and  $-2SD$  Z-score, and between  $\pm 2SD$  Z-score, respectively.

Sample size calculation based on the rule of thumb with 4 indirect variables and 20 sample each variable, so the minimal sample size was 80 subject. A categorical variable was analyzed using Chi-Square test and logistic regression test was used to analyze all indirect variables. Significantly relation was considered if P-value  $< 0.05$ .

### 3. Results and Analysis

Total 129 subjects were included, 56.6% male, mean aged was 4.1 years old, and 20.3% with chronic diseases. The characteristics can be shown in Table 1 below.

Table 1  
The characteristics of subjects

Characteristic	N = 129
Gender, Male, n (%)	73 (56.6)
Female, n (%)	56 (43.4)
Age (year), mean (SD)	4.1 (3.4)
Underlying disease, chronic, n (%)	26 (20.3)
Acute, n (%)	103 (79.7)
Nutritional status, severe, n (%)	8 (6.2)
Moderate, n (%)	33 (25.6)
Well nourish, n (%)	88 (68.2)
STRONGkids, High risk, n (%)	16 (12.4)
Moderate risk, n (%)	113 (87.6)

The relation between nutritional status and STRONGkids classification are shown in the following graph. Base on STRONGkids score, high risk for malnutrition in children with well nourished, moderate and severe malnutrition is 3.4%, 18.2%, and 87.5%, respectively (P = 0.0001). Children with chronic diseases, 30.8% were classified as a high risk for malnutrition, while children with acute diseases; only 7.8% were classified as a high risk for malnutrition (OR 5.2; 95%CI: 1.7-15.7; P = 0.002).

The following table shows the result of Logistic Regression analysis between indirect variable (age, gender, diseases, and nutritional status) and direct variable (STRONGkids classification).

Table 2  
Logistic Regression analysis among variables

Variable	Exp(B)	95%CI for Exp(B)	P
Age	1.0	0.9 – 1.0	0.488
Gender, male	1.2	0.3 – 5.0	0.752
Chronic disease	6.8	1.4 – 32.3	0.015
Severe malnutrition	10.9	3.6 – 33.0	0.0001

This study confirms that each child who is hospitalized is at risk for being malnutrition. Based on STRONGkids score, all subject (100%) in this study are classified as a high risk (12.4%) and moderate risk (87.6%) without low risk for malnutrition. Other studies in Romania and Brazil reported that risk for malnutrition in hospitalized children using STRONGkids score is lower (58% and 69%) [9,10], however, in Romania, the high-risk classification is higher (24%). [9] The differentiation of the studies may be caused by the different interpretation of each question in the STRONGkids assessment.

The goal of screening tools in hospitalized children identifies the risk of being malnutrition during hospitalized. After we know the risk of malnutrition we should increase the alertness of nutrition care. All children who are at risk for malnutrition need nutrition support because malnutrition among hospitalized is associated with longer length of hospital stay, higher of hospital cost, an increase of mortality rates.[1-3] The results of screening tools can help the doctor or nutritionist plans an appropriate nutritional interventions. Our hospital have been draw up a Pediatric Nutrition Care team since 2002. At that time the incidence of hospital malnutrition in children was still high. In 2008, we reported that the incidence of in-hospital malnutrition in our hospital about 30.1% and then four years later the incidence decreased to become 17%.[1,5] Another study in 2017, my colleague reported that the incidence of hospital malnutrition in children who were admitted in pediatric intensive care unit was 2.9%.[2] The

improvement of pediatric nutritional support care according to the underlying diseases is the reason why the hospital malnutrition in our hospital can be decreased.[19]

Our study found that severe or moderate acute malnutrition according to weight-for-height less than 3 or 2 SD of WHO growth standard at admission associated with high risk for malnutrition based on STRONGkids score classification. Children with severe acute malnutrition at admission have 10.9 times more high-risk classification on STRONGkids compare with well nourishes children. This result indicates that STRONGkids can be used to identify the risk of malnutrition in hospitalized. Other studies also reported that STRONGkids screening tool associated with malnutrition at admission and can be used to identify the risk of malnutrition in hospitalized.[8,11-13]

This study also found the relationship between STRONGkids classification and chronically of the diseases. Children who admitted with chronic disease compared with the acute disease tend to have a higher score of STRONGkids or more be classified as a high risk for malnutrition. Children with chronic diseases have 6.8 times to being high risk for malnutrition compare with children with the acute disease. Other studies also reported that children with really underlying diseases tend to have a higher risk of being malnutrition during hospitalized.[8,12] One study in China included 1325 hospitalized children reported that STRONGkids score associated with clinical outcomes. Children with high nutritional risk had higher complication rates, longer length of hospital stay, greater weight loss, greater hospital expenses, and need more nutritional support.[14,20]

Screening tool of malnutrition risk in hospitalized children increases clinician's alertness of the important of nutritional support during hospitalized. Children who have a risk for malnutrition need energy and other nutrients supplementation during in hospital. Optimal nutrients intake during hospitalized will help the disease recovery process. A meta-analysis of malnourished adult patients reported that nutritional support during hospitalized associated with lower both infectious and non-infectious complications and shortening the length of stay in the hospital.[15] Another study reported that early nutritional support in children less than 3 years old with congenital heart diseases after getting surgery reduced the length of stay and mortality rate.[16] Although adequate nutrition support in children and young adults during hospitalized improve the clinical outcomes, however, the importance of nutrition is still an underestimated.[17]

The strength of this study is including 7 of 10 hospitals around Bali (1 academic and 6 general hospitals), so indicating a representative group of hospitalized children. Several pediatricians or dieticians in each hospital, may be influencing the results, do the limitation of this study although all of them have been trained.[18]

#### 4. Conclusion

The study concludes that all children who hospitalized are at risk for being malnutrition. So they need nutritional support along with their hospitalization. Early and optimal nutritional supports improve the prognosis and clinical outcomes of the diseases. STRONGkids is practically easy to do and can be used to screen the risk of malnutrition in hospital.

#### Conflict of interest statement and funding sources

No conflicts of interest declared.

#### Statement of authorship

The authors have a responsibility for the conception and design of the study. The authors have approved the final article.

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