

# THE ADDITIONAL COSTS OF DISEASE RELATED MALNUTRITION IN HOSPITALIZED CHILDREN

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## Background

Disease related malnutrition (DRM) prevalence rate in European hospitalized children is high: from 7% up to 45%, with the highest prevalence rate occurring in children with infections, gastro-intestinal disease, mental and behavioral disorders and those with endocrine, nutritional or metabolic diseases [1-7].

DRM is associated with unfavorable outcomes such as: increased occurrence of diarrhea, vomiting, rates of infection, medical and surgical complications, poor wound healing and a decreased quality of life [1;8].

## Introduction

Studies in adults have shown that DRM is costing the society billions of euros [9;10]. In children however, there is a lack of data about the additional costs due to malnutrition, but it is presumed that these costs will be substantial[1]. For the purposes of this article the term malnutrition is used only for the illness related undernutrition, also known as disease related malnutrition (DRM) as only somatically ill children were included.

## Objective

To calculate the annual additional costs due to DRM for pediatric hospitalized patients in The Netherlands as was done for adults [12].

## Methods

A cost-of-illness analysis was performed using a developed formula (Fig 1). Input variables in the formula used were length of stay and prevalence of DRM. The most recent data were used and obtained from a study, performed in nine non-academic Dutch hospitals in 2013 and 2014, in which the nutritional status from admission to the pediatric hospital ward (including surgical patients) until 4-8 weeks after discharge was assessed in somatically ill children aged 1 month up to and including 17 years (n=2015), with an expected stay of at least one day [11].

The costs were estimated per disease as classified in the International Classification of Diseases by the WHO (ICD-10), per gender and age group.

Robustness of the results was checked by a sensitivity analysis.

## Results

Table 1: Total additional costs of DRM in hospitalized children according to gender, age and type of malnutrition \* 1.000.000 (Euro 2013).

Age (years)	0 <sup>a</sup>		1-4		5-9		10-14		15-17		Total	Total
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls		
DRM												
Acute	6.1	3.4	10.6	7.2	3.8	5.1	2.4	4.6	5.2	2.7	28.1	51.1
Chronic	6.4	1.8	8.8	5.5	1.7	5.3	1.9	5.2	5.4	3.5	24.2	45.6
Overall <sup>b</sup>	7.7	3.5	16.4	10.3	5.3	8.0	4.1	8.2	9.7	6.2	43.3	79.5

<sup>a</sup> infants >1 month old

<sup>b</sup> Overall malnutrition is defined as acute or/and chronic malnutrition

Children with gastro-intestinal, neurological and respiratory diagnoses appeared to be the most costly. Most noticeable are the patients with an infectious disease. Having the most patients in the study combined with one of the highest DRM prevalence, this ICD group was one of the less costly. Whereas this is the case for all other ICD groups, the difference could be explained by relatively low national costs for infectious diseases in children.

## Conclusion

This analysis has shown that DRM in children admitted in Dutch hospitals is accountable for annual additional hospital costs of about € 80 million (5.6% of the total Dutch hospital costs for these hospitalized children). Acute malnutrition is responsible for the biggest share compared to chronic malnutrition.

Continuous monitoring of the nutritional status in chronically ill children is important to detect and manage malnutrition early, to contribute in decreasing negative clinical and associated economic consequences. As intervention while hospitalized may be limited due to short length of stay, it stresses the need to discharge children with an optimal nutritional advice and follow-up of nutritional status.

Figure 1: Formula to estimate the total additional annual costs per patient group due to DRM

$$(\text{weight factor } -1) * \text{prevalence of malnutrition} * \left[ \frac{\text{total disease costs}}{(\text{weight factor} * \text{prevalence of malnutrition}) + (1.0 * \text{prevalence of no malnutrition})} \right]$$

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Unrestricted funded by Nutricia Advanced Medical Nutrition

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