



Review

The economic cost of hospital malnutrition in Europe; a narrative review



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ABSTRACT

Background: Malnutrition among hospitalized patients increases length of stay (LOS) and carries extra hospitalization costs.

Objective: To review the impact of malnutrition on hospital LOS and costs in Europe.

Methods: PubMed and Google Scholar search. All articles from January 2004 until November 2014 were identified. Reference lists of relevant articles were also manually searched.

Results: Ten studies on LOS and nine studies on costs were reviewed. The methods used to assess malnutrition and to calculate costs differed considerably between studies. Malnutrition led to an increased LOS ranging from 2.4 to 7.2 days. Among hospitalized patients, malnutrition led to an additional individual cost ranging between 1640 € and 5829 €. At the national level, the costs of malnutrition ranged between 32.8 million € and 1.2 billion €. Expressed as percentage of national health expenditures, the values ranged between 2.1% and 10%.

Conclusions: In Europe, malnutrition leads to an increase in LOS and in hospital costs, both at the individual and the national level. Standardization of methods and results reported is needed to adequately compare results between countries.

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Introduction

Malnutrition is a highly prevalent problem among hospitalized patients and leads to a considerable adverse health and financial burden [1,2]. Estimates for the worldwide prevalence of malnutrition range between 20 and 50% of hospitalized patients, depending on the population under study and the nutritional screening tools used [3].

Hospital malnutrition is a result of a complex relation between disease, food and nutrition [4]. According to the European Society for Parental and Enteral Nutrition (ESPEN), malnutrition consists of

both over- and under-nutrition but in this study only under-nutrition will be considered [3]. Indeed, under-nutrition, also known as disease related malnutrition (DRM), is an urgent public health problem in Europe [5]. Hospital malnutrition has been shown to increase morbidity and LOS, to delay recovery and therefore to result in higher health care and hospital costs [6–8]. Just in Europe, it has been estimated that 20 million patients are at the risk of malnutrition, with an annual cost up to 120 billion € [9,10]. Notwithstanding its impact on health, the economic impact of hospital malnutrition has seldom been studied. In a period where health costs containment is a necessity, better identification of the factors associated with increasing hospitalization costs is paramount to optimize health care delivery. Thus, we aimed to review the impact of hospital malnutrition on LOS and health costs in Europe.

Methods

Literature search strategy

A literature search was conducted in November 2014 using PubMed (MEDLINE) and Google Scholar electronic databases. The

Abbreviation: LOS, length of stay; ESPEN, European Society for Parental and Enteral Nutrition; DRM, disease related malnutrition; NRS, Nutritional Risk Screening; SGA, Subjective Global Assessment; NRI, Nutritional Risk Index; MUST, Malnutrition Universal Screening Tool; BMI, Body Mass Index; DRG, diagnosis-related group.

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search terms used are summarized in [supplementary file](#). All relevant studies published between January 2004 and November 2014 reporting the associations between malnutrition among hospitalized patients and LOS or cost were evaluated. The following key terms included “prevalence”, “length of stay”, “cost” in combination with “hospital malnutrition” and “hospital under-nutrition”.

Studies were included if they were a) published from 2004 onwards, as older studies might not correspond to current standards of malnutrition screening and health care delivery and as costs no longer corresponded to current ones; b) conducted among adults (≥ 18 years old), with no upper age limit; c) conducted in any European country, as universal health coverage is available for most European countries and health expenditures would not be influenced by individual or third party payers; and d) had an English/French/German/Spanish/Portuguese abstract, as other languages could not be assessed by the authors or colleagues. Duplicate publications (i.e. reporting the results of the same study) were excluded.

Data extraction

Titles of articles were analyzed for selecting potentially relevant studies. Then, the abstract and the full text were examined in terms of the eligibility criteria, and the references were also searched for other potential studies not covered by the search strategy.

Data on study characteristics (author, title, country and publication year), study duration, number of patients, prevalence of malnutrition, LOS and/or costs related to malnutrition were extracted by SK, and further confirmed by PMV. Main summary measures were LOS and/or costs related to malnutrition. Both individual (i.e. patient) and overall (i.e. for the whole country) costs were considered. As costs were expressed in different currencies, conversion to Euros (€) was performed using the rates of November 4th, 2014 as indicated in www.xe.com/currencyconverter.

Results

Impact of malnutrition on length of stay

Ten papers were included (selection procedure on [Fig. 1](#)). Their main characteristics are summarized in [Table 1](#). Three studies were from Germany [7,11,15], three from Spain [12–14], two from Switzerland [15,16], one from Portugal [6], one from France [17] and one from Norway [18]. Seven studies were multidisciplinary, i.e. conducted in different medical departments [6,11–15,18]; the remaining were conducted in a gastroenterology ward [7], in a cancer center [17] and in an internal medicine department [16]. One article had data on LOS according to malnutrition status, but it was unclear which definition was applied, so it was not included; LOS was 6.3 ± 4.7 for well nourished and 10.6 ± 12.0 for malnourished patients, respectively [19].

Four studies used the Nutritional Risk Screening (NRS-2002) [6,13,14,18], three used the Subjective Global Assessment (SGA) [7,11,12], one used both SGA and NRS-2002 [16], one used the Nutritional Risk Index (NRI) [15] and one study did not report the tools [17]. Prevalence of malnutrition ranged from 19 [7] to 42% [6]. These results are in agreement with a review of malnutrition prevalence in England since 1994 (range 11–45%) [20] and with a collaborative multicentre study including 12 Europe and Middle East countries (32% overall) [21].

In all studies, LOS was significantly longer in malnourished than in well-nourished patients, the differences ranging from 2.4 [12] to 7.2 days [13] ([Table 1](#)). Two studies reported a positive association

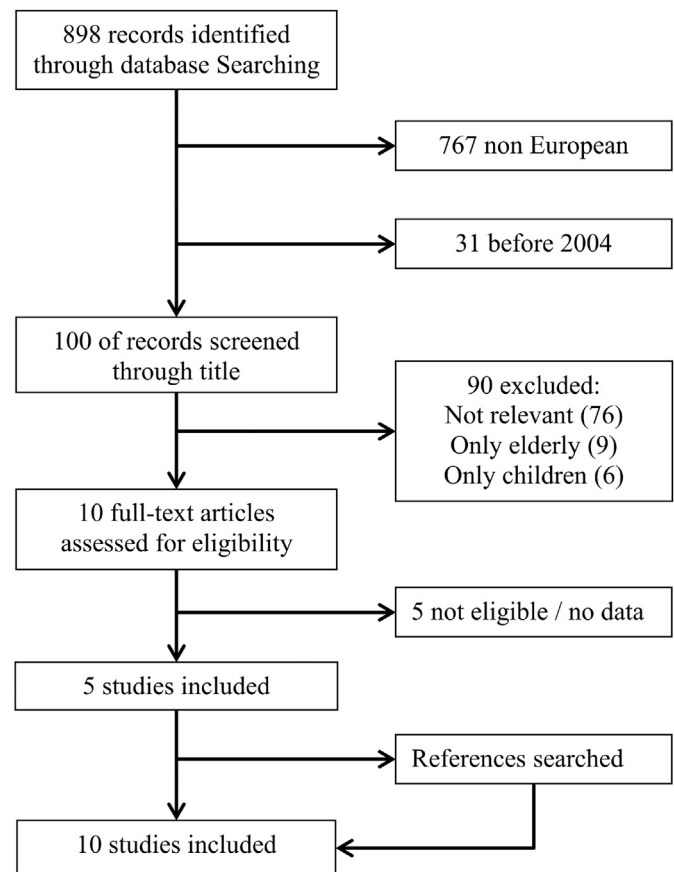


Fig. 1. Selection procedure for the papers on length of stay.

between malnutrition classification (mild, moderate and severe) and prolonged LOS [11,15]. In the Switzerland study in 2004, severe malnourished patients had a five-fold increase of LOS compared to well-nourished patients (25.8 ± 60.6 vs. 5.1 ± 8.2 days, respectively) [15].

No clear trend regarding malnutrition prevalence or its impact on LOS was found within the 10 years period. This unchanged prevalence of malnutrition could be due to the increasing age of hospitalized patients [22], which could also impact LOS. Still, the fact that LOS among malnourished patients did not improve during the period analyzed relative to well nourished patients suggests that nutritional interventions in hospitalized patients are not sufficient.

Impact of malnutrition on hospital costs

Nine papers investigating the economic costs of malnutrition among hospitalized patients were included (**selection procedure on [Fig. 2](#)**). Their main characteristics are summarized in [Table 2](#). Except one study conducted in a Gastroenterology Ward [7] all the others were multidisciplinary [6,7,10,13,15,18,23–25]. For nutritional status, one study used the NRI [15], one the SGA [7], four the NRS-2002 [6,13,18,24], two the Malnutrition Universal Screening Tool (MUST) [23,25] and one used Body Mass Index (BMI) and weight loss [10]. Most malnutrition rates ranged from 19 [7] to 44% [10], with the exception of the Croatian study, which reported a much lower prevalence (3.37%) [24]. One paper had data on costs according to malnutrition status, but it was unclear which definition was applied, so it was not included; total costs were 1912 € (no

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