Nutrition Screening: Coding after Discharge Underestimates the Prevalence of Undernutrition

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ARTICLE INFORMATION

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AT THIS TIME, SCREENING FOR MALNUTRITION IN children upon admission to hospital settings is widely recommended as part of a patient's standard care because malnutrition upon admission or deterioration of nutritional status during hospitalization is common.[1] Assessment of nutritional status is most frequently based on anthropometric measurements of weight and height that are compared with growth reference standards using *z* scores, thereby demonstrating under- or overnutrition. To assess the risk for developing malnutrition during hospital stay, a number of nutrition screening tools have been developed. These tools help to raise awareness of clinicians about the nutritional status of children and can give direction to the initiation of specific nutrition therapy shortly after admission.[2,3]

The work presented by Carvalho-Salemi and colleagues[4] expands upon work by Abdelhadi and colleagues[5] by using 10 years of discharge data to compare pediatric patients (aged 1 month to 17 years) with coded diagnoses of malnutrition to those without a coded diagnosis of malnutrition. Like the study by Abdelhadi and colleagues,[5] the presented work uses preselected malnutrition-related diagnostic codes to identify pediatric patients who may have had malnutrition. The work by Carvalho-Salemi and colleagues[4] provides descriptive data of short-term clinical outcomes for each group (malnutrition vs no malnutrition) as well as for selected malnutrition subgroups and compares the costs for each group. Because the presented work uses 10 years of data, the authors were also able to estimate and describe temporal trends in the coded diagnoses of malnutrition.

Malnutrition: Coding and Subtyping

The codes of pediatric malnutrition (CDM) were derived according to the International Classification of Diseases, Ninth Revision, Clinical Modification system.[6] These codes are used to identify pediatric malnutrition and other diagnoses and procedures among inpatient hospitalizations of children. In this system, there is a list of approximately 15 different diagnoses to classify different malnutrition subtypes. These subclassifications can be rather confusing because there is a great overlap between the different subtypes; for example, protein-calorie malnutrition vs nutritional marasmus vs malnutrition of moderate degree. Although in 2013 a new definition of pediatric malnutrition was proposed by Mehta and colleagues,[7] no modifications were made to the International Classification of Diseases, 10th Revision, Clinical Modification[6] malnutrition diagnosis codes. Among the purposes of the study by Carvalho-Salemi and colleagues[4] was to highlight potential gaps in the coding of pediatric malnutrition in hospital settings and their implications for future research. The authors did not comment on these potential gaps in the coding of pediatric malnutrition. Moreover, they grouped their patients into six different CDM subtypes, with the highest percentage of patients in the postneonatal failure to thrive group (46.2%) and considerably lower percentages in the other five groups; that is, protein-calorie malnutrition group (13.2%), abnormal loss of weight and underweight group (11.6%), anorexia (not including anorexia nervosa) group (9.3%), other and unspecified postsurgical nonabsorption group (9.3%), cachexia group (<1%), and nutrition-related child neglect group (<1%). In this study, the highest prevalence of CDM was found in infants and an inverse association between CDM and age was observed. It is unclear how Carvalho-Salemi and colleagues[4] eliminated children aged <1 month from their analysis. Nevertheless, compared with children aged <1 year, children aged 1 to 4, 5 to 9, and 10 to 17 years experienced 25%, 58%, and 62% decreased odds of CDM, respectively. From these data one could suggest 2 CDM subtypes: postneonatal failure to thrive for infants up to age 1 year and protein-calorie malnutrition with loss of weight for children aged >1 year. Considering the new definition of pediatric malnutrition of Mehta and colleagues,[7] the CDM subtype group classification does not account for the variety of etiologies and dynamic interactions that are relevant in relation to nutritional depletion in children. Furthermore, in the definition of Mehta and colleagues[7] no differences in age categories are described and "failure to thrive" is used to describe children who are not growing as expected. In conjunction with the publication of Mehta and colleagues,[7] a consensus statement was published by the Academy of Nutrition and Dietetics and the American Society for Parenteral and Enteral Nutrition in which recommended indicators for the identification of pediatric malnutrition are stated.[8] To classify mild, moderate, and severe malnutrition, the indicator consists of only anthropometric values (weight-for-height *z* score, body mass index [BMI]-for-age *z* score, length/height-for-age *z* score, and midupper arm circumference *z* score) when on initial presentation a single data point is available. When two or more data points are available, the classification mild, moderate, and severe malnutrition is based on weight gain velocity (for children aged <2 years) or weight loss (for individuals aged 2 to 20 years), deceleration in weight-for-length/height *z* score, and inadequate nutrient intake. The value of these indicators has to be investigated before new recommendations can be made.[9]

New Definitions

Besides definitions based on anthropometric variables and etiology, it is recognized more and more that body composition measures of both fat mass and fat-free mass should be taken into account. A study in children undergoing treatment for various clinical conditions showed that independent of BMI, alterations were measured in body cell mass.[10] Recently, The European Society for Clinical Nutrition and Metabolism proposed a new definition of malnutrition in adults in which fat-free mass is incorporated.[11] Two alternative sets of diagnostic criteria are proposed to confirm the diagnosis malnutrition: (A) BMI <18.5; or (B) unintentional weight loss >10% of initial body weight irrespective of time or >5% during the past 3 months combined with either (a) a BMI <20 in case of age younger than 70 years or BMI <22 in case of age older than 70 years, or (b) a fat-free mass index <15 and <17 in women and men, respectively.[11] As stated by Carvalho-Salemi and colleagues,[4] research is urgently needed to validate and incorporate additional assessment methods of malnutrition in children. Outcome research will validate these assessment methods as indicators and will result in new discoveries of effective ways to prevent and treat malnutrition.[9]

Prevalence of Malnutrition: Underestimation

It is very likely that diagnosis of malnutrition is highly underestimated using the methods of the presented work. The 2.6% found by Carvalho-Salemi and colleagues[4] is rather low in comparison with previous studies done in developed countries. In those studies,[1,12-15] a prevalence of acute malnutrition (based on weight) was found to be between 6.1% and 11.9%, for chronic malnutrition (based on height) to be between 7.2% and 10%, and for overall malnutrition to be between 13.3% and 20%. When using the normal distribution curves to classify malnutrition (for example, with a weight-for-height *z* score of less than −2 standard deviations), 2.3% of children would automatically be called acutely malnourished. So the reported percentage of 2.6% is about the same as what one would expect to be normal variation in the population. Carvalho-Salemi and colleagues[4] recognized this underestimation and stated in the Discussion that their prevalence findings should be interpreted within the context of existing literature that overwhelmingly suggests a large discrepancy between CDM and actual malnutrition prevalence. Furthermore, there might also be a difference in the prevalence of malnutrition on admission and the prevalence of malnutrition at discharge from a hospital. A few studies[12,15-17] have reported the deterioration of nutritional status during admission. In these studies,[12,15-17] weight loss >2% or >5% were reported in up to 65% and 25%, respectively. There is a scarcity of research on the prevalence of malnutrition on discharge. In a study in the Netherlands in hospitalized children who stayed >4 days in a hospital,[12] the prevalence rate of acute malnutrition at discharge was 21%—the same as on admission.

Temporal Trends

It was also noted by Carvalho-Salemi and colleagues[4] that the proportion of hospitalized patients aged 1 month to 17 years with CDM increased from 1.9% in 2002 to 3.7% in 2011. The authors[4] explained that a number of factors may have contributed to this change in CDM: an increased volume of hospitalized children with medical complexity; improvements in pediatric malnutrition screening, assessment, and classification systems; and a heightened awareness of the importance of accurate malnutrition coding practices. Data about trends in prevalence of malnutrition can also be found from countries in which mandatory screening for acute malnutrition is performed. In the Netherlands, mandatory screening for acute malnutrition of all children aged >1 month who are admitted to a hospital for longer than 24 hours has been required since 2008 as part of a national quality indicator.[18] Hospitals collect data about screening of acute malnutrition and report it to the Dutch Health Care Inspectorate as part of a national quality-benchmarking program. Approximately 80,000 to 100,000 children are admitted yearly to Dutch hospitals and approximately 75% of these children were screened. Over the years, a gradual decline in the prevalence of acute malnutrition has been noted—from 10.7% in 2009 to 6.5% in 2015.[18] The largest difference between the US system and the system in the Netherlands is that data are collected directly after admission in the Netherlands and not after discharge, as is the practice in the United States. Furthermore, at the start of mandatory screening in 2008 only 37% of Dutch hospitals reported screening data, but in the past 5 years all the hospitals in the Netherlands have shown their results. Therefore, mandatory screening is a tool to get reliable screening data. Moreover, treatment data are also available because according to this national quality-benchmarking program, data on energy and protein intake on Day 4 need to be reported by hospitals in all children above 1 year of age with acute malnutrition upon admission.

Risk Groups

In the study by Carvalho-Salemi and colleagues,[4] the highest rates of CDM were observed in pediatric patients with cystic fibrosis, human immunodeficiency virus infection, congestive heart failure, esophageal disorders, enteritis/ulcerative colitis, stomach cancer, and atherosclerosis. Previous studies have shown the highest rate of malnutrition to occur in children with infections, gastrointestinal disease, mental and behavioral disorders, and those with endocrine, nutrition-related, or metabolic diseases.[1,19-22] Furthermore, a high percentage of malnutrition is reported in children with an underlying disease—up to 45%.[1,19-21] From a clinician's perspective and in line with the etiology-related definition of Mehta and colleagues,[7] it is important to recognize those children with a higher risk of malnutrition. Screening tools have been shown to be useful to raise awareness of the severity of the underlying disease, which may increase nutritional requirements and are, therefore, advocated for use in clinical settings.[3]

This study[4] showed pediatric malnutrition to be associated with higher infection rates, increased risk for complications, reduced wound healing, extended length of stay (10.2 vs 5.4 days), less likelihood of being discharged home, higher rate of in-hospital mortality, and reduced quality of life. These data are in line with a recently published, large, prospective study[1] among 14 tertiary hospitals in 12 countries in Europe in which 2,567 children were assessed upon admission. Malnourished children had a longer length of stay and more diarrhea and vomiting than children with good nutritional status, whereas no associations with infections were found. Moreover, in that European study,[1] quality of life was lower in malnourished children. In the study by Carvalho-Salemi and colleagues,[4] nearly 16% of CDM children received parenteral or enteral nutrition, compared with 30.5% in the European study.[1] However, the effect of nutrition intervention on outcome was not investigated in either study. Because malnutrition and outcome are associated, there is an urgent need for nutrition intervention studies in which short- and long-term outcomes are taken into account.[23] Along with the long-term consequences of illness for children and their families, there is also a societal burden. This includes the costs of treatment during hospital admission as well as lifetime health-related costs. There are few studies about the economic consequences of malnutrition. In the present study,[4] the mean, per-hospitalization cost of all inpatient care was almost twice as high for children with vs without CDM.

In conclusion, the present work by Carvalho-Salemi and colleagues[4] suggests that there are gaps in the coding for malnutrition after discharge of children from hospital settings that may lead to a significant underestimation of the actual prevalence of malnutrition. This study also underscores the need for national benchmarking programs. Despite the fact that there might have been considerable underestimation of the number of children diagnosed with malnutrition during a hospital stay, Carvalho-Salemi and colleagues[4] have shown which subgroups are at highest risk for malnutrition, and found important associations between malnutrition and morbidity, hospital use, and mortality. Among other studies, this study underlines the urgent need for nutrition intervention studies in hospitalized children in relation to short- and long-term outcomes.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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