

## Editorial

# Pediatric and Neonatal Malnutrition: A Collaborative, Family-Centered Approach Improves Outcomes

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Assessment of nutritional status and ensuring adequate nutrient intake are essential components of health care for infants and children who are ill. Pediatric malnutrition is defined as “an imbalance between nutrient requirement and intake, resulting in cumulative deficits of energy, protein, or micronutrients that may negatively affect growth, development, and other relevant outcomes.”<sup>21</sup> It is either illness-related or caused by social/environmental factors that result in decreased nutrient intake. It is classified as acute (less than 3 months) or chronic (greater than 3 months) in duration.<sup>1</sup>

Malnutrition should be documented and treated for several reasons.<sup>2</sup> Although malnutrition is common—especially among hospitalized children with acute or chronic illness, special health care needs, and socio-environmental issues such as abuse, homelessness, or limited access to high quality nutritious food<sup>3,4</sup>—its true prevalence is underreported and not well understood. According to Healthcare Cost and Utilization Project data from 2002-2011, 2.6% of children hospitalized annually received a coded diagnosis of malnutrition; and overall prevalence increased by 8% annually during the same time frame.<sup>3</sup> Previous studies using criteria other than coded diagnosis of malnutrition have reported a prevalence of 6% to 51%.<sup>1</sup> Very low-birth-weight infants are also at high risk for malnutrition due to increased nutrient requirements and altered nutrient utilization related to an immature gastrointestinal tract. Research indicates extrauterine growth failure, usually defined as weight less than the 10<sup>th</sup> percentile at discharge or 36-40 weeks, is common in preterm infants.<sup>5-7</sup> Awareness of pediatric undernutrition by health care providers has increased over the past 5 years; yet without an accurate understanding of malnutrition prevalence during infancy and childhood, the clinical significance and associated costs are difficult to quantify.

Malnutrition increases consumption of health care resources due to its association with adverse outcomes. These adverse outcomes can range in severity and have lifelong repercussions in some cases: loss of lean body mass, muscle weakness, developmental/intellectual delays, infections, immune dysfunction,

delayed wound healing, prolonged length of hospital stay, and even death.<sup>1,3,8</sup> Optimal nutrition can also ameliorate medical complications of prematurity that are associated with increased length of stay and costs.

Diagnosing malnutrition can increase reimbursement for hospital care for an individual patient and over time increases the acuity factor for the facility.<sup>2</sup> ICD-10 codes E44.1 (mild protein/calorie malnutrition), E44.0 (moderate protein/calorie malnutrition), and E43.0 (severe protein/calorie malnutrition) should be used in place of P92.6 (failure to thrive). Even if reimbursement is not increased, malnutrition should be identified, evaluated, treated and monitored for optimal long term outcomes. Malnutrition added to the problem list on the discharge summary will inform the medical staff following the patient post discharge to continue focus on the correction of growth deficiencies. Nutrition affects growth and development and can have lifelong impact.<sup>9</sup> The first 1,000 days of life is the peak time for brain development, and brain development is dependent on optimal nutrition. Research indicates that there are critical periods in brain development that depend on the availability of specific nutrients and that later supplementation cannot make up the deficit.<sup>2</sup> A strong relationship between nutrition, brain growth, and neurodevelopmental outcomes exists. Several studies have demonstrated a link between poor growth and neurocognitive development up to 19 years of age.<sup>5,10-22</sup> Early aggressive nutrition during the first two weeks of life promotes better brain growth and accelerated white matter maturation and promotes better growth.<sup>23-27</sup> Poor head growth during the NICU stay and post discharge has been associated with motor and cognitive delays.<sup>28</sup> Catch-up in weight and head growth after 36 weeks improves neurodevelopmental outcomes.<sup>6,7,28</sup> Research supports a link between length, brain development, and neurocognitive outcome.<sup>16,17,19,29-31</sup> This link is reinforced by body composition studies that have revealed less lean body mass with similar fat mass in preterm infants, even late preterm infants, at hospital discharge compared to term infants.<sup>32-35</sup> This linear growth failure combined with expected fat mass accretion suggests that a decline in length z

scores or inadequate linear growth velocity is an important indicator of malnutrition in preterm infants and neonates. Early monitoring of growth to detect growth deficits is a strategy for improving growth outcomes.<sup>24</sup>

The most rapid growth phase in the life cycle occurs in preterm infants and neonates and they are most vulnerable to calorie, protein, and nutrient deficits during this time. Variations in growth rates between NICUs can be attributed to variations in nutrition practices.<sup>36-44</sup> There is substantial research that supports the fact that nutrition practices impact growth and that extrauterine growth failure can be ameliorated or prevented.<sup>36-42,44-47</sup>

In 2014 the Academy of Nutrition and Dietetics and the American Society for Parenteral and Enteral Nutrition published a consensus statement with recommended indicators for identification of pediatric malnutrition in children 1 month of age to 18 years of age.<sup>4</sup> The indicators describe criteria for mild, moderate, and severe malnutrition based on weight, length, BMI, weight for height, mid-upper arm circumference and nutrient intake. Preterm infants and neonates less than 28 days are not included. To fill this gap, the Pediatric Nutrition Practice Group of the Academy of Nutrition and Dietetics published recommended indicators for identifying malnutrition in preterm infants and neonates in 2018.<sup>48</sup> The indicators also describe criteria for mild, moderate, and severe malnutrition using weight, length, and nutrient intake.

Identification of malnutrition starts with nutrition screening which is often completed by nurses. Nutrition screening, although conducted through different processes at different institutions, has the shared goal of identifying malnutrition risk in a timely manner so that a nutrition care plan can be implemented to prevent further deterioration in nutrition status and subsequent unfavorable outcomes. Because nurses and nursing staff have early and consistent contact with pediatric and neonatal patients and their families, their role in the process of nutrition screening, identification, documentation, and implementation of treatment plans for malnutrition should not be understated. From the initial physical exam when signs and symptoms of muscle wasting and subcutaneous fat loss may be observed; to assistance with feeding, bathing, dressing, and other activities of daily living when delays and changes from a child's baseline functional status may be noted; to facilitating consults and referrals for clinical nutrition services; to noticing the affect and interactions of caregivers with their children throughout the course of bedside care; to the rapport that is developed between nursing staff and families and also with the entire health care team; to obtaining and documenting accurate anthropometric measures used in malnutrition assessment as well as in monitoring and evaluation of the care plan; to ensuring the timely and appropriate administration of nutrition orders; the list of ways in which nurses and nursing staff are essential to the nutrition care process goes on and on. For one example, accuracy of the diagnosis of malnutrition is dependent on precise anthropometric measurements obtained using recommended technique and equipment. Length measurements obtained using a nonstandard length board or a tape measure are frequently inaccurate when compared with measurements obtained using recommended equipment and technique.<sup>49</sup> Valid length measurements can increase the number

of infants identified with growth abnormalities.<sup>50</sup> Nurses may be the first member of the health care team to recognize red flags and other malnutrition risk factors, they often have the best sense of family dynamics, and they are indispensable allies for pediatric and neonatal registered dietitian nutritionists in our quest to create optimal health for infants, children, and adolescents through the healing power of food and nutrition.

The identification and documentation of pediatric undernutrition, especially illness-related malnutrition often seen in acute care as well as hospital ambulatory care settings, is a multi-step process. Recommended indicators are evidence-informed and consensus-derived, and a validation effort is currently underway with the Malnutrition Clinical Characteristics Validation and Staffing Optimization Study by the Academy of Nutrition and Dietetics. In addition to evaluating the predictive validity of the indicators in relation to patient outcomes, interrater reliability and quantification of nutrition care associated with improved inpatient outcomes will be evaluated.<sup>51</sup> As a result; we will undoubtedly see future changes to the process. The goal to identify malnutrition risk sooner, intervene earlier, and prevent adverse outcomes will not change. Nor will the fact that effective management of pediatric and neonatal malnutrition requires collaborative, interdisciplinary, and patient-centered interventions. All members of the health care team must recognize the impact of malnutrition on quality of life, on both developmental and treatment outcomes, and on reimbursement for services. They must recognize the urgency surrounding early identification and treatment of undernutrition in all patient populations from preterm infants to adolescents and on into adulthood. New research is needed in establishing interdisciplinary protocols for screening, diagnosis, treatment, and coding. More data is needed on prevalence for national benchmarking in order to evaluate trends and measure the effects of interventions. Keeping up with the changing landscape of malnutrition might seem overwhelming or even unnecessary at times. But pediatric malnutrition is one thing we can't afford to overlook on any day or any shift.

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