Nutritional Challenges in Pediatric Oncology Patients Receiving Radiation Therapy

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Pediatric oncology has made remarkable strides in recent decades, achieving over 80% success rates in high-income countries like the United Staes (Franke, Bishop, Runco 2022). A key factor in the progress is the critical role pediatric nurses play in addressing malnutrition and cachexia, conditions that significantly impact treatment outcomes. Through specialized nutritional support, nurses employ targeted assessments, individualized interventions, and comprehensive education to mitigate the side effects of treatments like chemotherapy and radiation. Their goal is to ensure optimal nutrition in the least invasive and most natural way possible, having both treatment tolerance and quality of life for pediatric oncology patients. Pediatric nurses are a crucial part of alleviating malnutrition and cachexia in children undergoing radiation therapy by implementing enteral feeding protocols and tailored dietary counseling to optimize nutritional status, enhance treatment tolerance, and improve quality of life.

Maintaining proper nutrition is essential for healing and resilience during medical treatments, yet it is often challenging due to side effects such as nausea, vomiting, fatigue, and poor appetite. Radiation therapy specifically can further complicate nutrition by causing localized issues like ulcers or gastrointestinal problems. Pediatric nurses are instrumental in combating these challenges by implementing enteral feeding protocols and providing tailored dietary counseling. These strategies help optimize nutritional status, reduce treatment-related complications, and improve overall well-being.

Malnutrition in pediatric cancer patients is known as critical imbalances between nutrient requirements and intake that leads to detrimental effects on linear growth, neurocognitive development, physiological function, and overall clinical outcomes (Podpeskar et al. 2023). This condition affects an alarming proportion of this vulnerable population, with prevalence rates

reaching up to 70%- predominantly among children diagnosed with solid tumors, where treatment-related factors such as chemotherapy- induced nausea, mucositis, and altered metabolism exacerbate nutritional deficits (Podpeskar et al. 2023). On the contrary, while acute malnutrition remains a dominant concern during active therapy, survivors of childhood malignancies face an elevated long-term risk of adult-onset comorbidities. These include obesity driven by steroid exposure and lifestyle disruptions, cardiovascular disease linked to anthracycline cardiotoxicity and radiation effects, and endocrine disorders such as growth hormone deficiency, hypothyroidism, and metabolic syndrome (Podpeskar et al. 2023).

Malnutrition is particularly prevalent among patients with solid tumors compared to those with leukemia, driven by factors related to the disease itself or its treatment. Nurses must be vigilant in identifying risk factors such as age, treatment side effects, medication types, and tumor locations. As the primary caregivers in directed contact with patients, nurses are uniquely positioned to quickly recognize and address symptoms of cancer and treatment-related complications. Regular monitoring of laboratory results, including biochemical tests, allow nurses to detect electrolyte imbalances and metabolic changes, enabling timely interventions and informed treatment decisions (Budka-Chrzeszcyk et al. 2024).

Nutritional status is a critical concern in pediatric oncology, as malnutrition cn impair tissue function, alter body composition, and lead to adverse health outcomes, including delayed treatment, increased infection risk, and higher relapse rates (Meral, Kangalgil, Erudran, 2025, pp. 154-160). To diagnose malnutrition accurately, nurses utilize screening tools, anthropometric measurements, full body assessments, biochemical examinations, and detailed dietary histories. Accurate data collection is vital to avoid skewed results. For instance, precise body weight measurements- taken in kilograms with minimal clothing, without shoes, and using a scale

sensitive to 100 grams0 are essential for determining appropriate medication dosages. Additional measurements, such as height and body circumferences, along with body mass index (BMI) calculations, help assess whether a child is underweight and guide nutritional interventions (Meral, Kangalgil, Erudran, 2025, pp. 154-160).

The most ideal way to nourish a child with cancer is through the gastrointestinal tract, as most children with cancer are no in a hypermetabolic state and do not require excessive nutrient intake. Experts recommend that children consuming less than 60% of their recommended nutrient intake be counseled by a dietitian to ensure nutritional needs are met (Tripodi et al. 2022). However, dietary plans must align with both the child's preferences and the dietitian's recommendations to be effective. Pediatric nurses play a pivotal role in this process by facilitating communication between hospital dietary teams, the patient, and their family. They ensure that inpatients receive appropriate meals and collaborate with the child to identify preferred foods, encouraging adherence to nutritional plans, nurses also educate families on food shopping, cooking, and appropriate serving sizes. Beyond coordination, nurses document patients' dietary intake during hospital stays, providing critical data for providers to determine when oral supplements- available as shakes, powders, or semi-solids- are needed. By involving the child in choices like supplement flavor or delivery method, nurses foster a sense of empowerment, enhancing compliance and supporting overall goals (Tripodi et al. 2022).

Nutritional status profoundly influences healing and clinical outcomes in pediatric cancer patients, directly impact overall survival, treatment tolerance, infection risk, and long-term quality of life (Fabozzi et al. 2022). Given its far-reaching effects and potential for intervention, nurses recognize optimal nutrition as a critical modifiable prognostic factor- one tha can be actively managed to improve prognosis (Fabozzi et al. 2022). This is especially vital during

childhood, a period often encompassing peak growth periods; disruptions in nutritional intake can irreversibly impair linear growth, bone mineralization, and achievement of genetic growth potential. Beyond supporting tissue repair and immune function during cancer therapy, nutritional interventions must also prioritize preservation of normal growth trajectories and developmental milestones. To achieve this, systematic nutritional screening is essential throughout the treatment and after remission. Screening intervals should be tailored to disease phase and risk: as frequent as every 3-4 weeks during intensive therapy, transitioning to 6–12-month evaluations in follow up care. Accurate assessment demands precision in anthropometric measurements, with careful consideration of confounding factors. For instance, BMI may be misleading in the presence of large tumors, organomegaly, or prior amputations, which artificially inflate or distort weight-based tools. On the contrary, standard anthropometrics fail to differentiate between fat mass, lean muscle, and fluid retention which are critical distinctions in a population prone to low muscle mass with high body fat or treatment-related edema (Fabozzi et al. 2022).

Biochemical markers complement physical assessments by providing deeper insights into body composition and metabolic health. These include serum proteins, organ function panels, bone health, anemia indices, inflammatory markers, and specific mineral and vitamin deficiencies. Importantly, malignancy type and treatment modality can alter these parameters. For example, leukemias may suppress albumin via inflammation, while solid tumors or gastrointestinal involvement may drive specific vitamin malabsorption (Fabozzi et al. 2022). Integrating anthropometric, biochemical, and clinical data- that will be collected by the nurse- enables a comprehensive, dynamic evaluation of nutritional risk and guides timely, personalized interventions.

The timing and clinical practice of nutritional therapy vary widely. Before initiating enteral feeding, a stepwise approach is typically followed. The first step would try to ensure the patient consumes at least 50% of the recommended nutrient intake (Trehan et al. 2020). If this is unachievable, consider oral nutritional supplementation as needed. Enteral feeding is indicated when energy and nutrient requirements cannot be met through food or supplements alone (Trehan et al. 2020). Nurses monitor for key signs that requirements are unmet, including new or worsening fatigue, severe wasting, more than 5% weight loss since diagnosis, or a more than 10% decrease in mid-upper-arm circumference since diagnosis (Trehan et al. 2020). Based on these observations, the nurse reports to the physician and recommends appropriate interventions. The primary barrier to starting enteral nutrition is parental resistance. Parents often delay nasogastric tube placement as long as possible and may even use it as a scare tactic to encourage eating (Trehan et al. 2020). At this stage, family education and emotional support are circa. Nurses are ideally positioned to provide clear explanations, written materials, and reassurance-leveraging the rapport they've build to address concerns and guide families through the process.

Malnutrition remains the most actionable determinant of treatment tolerance and long-term morbidity in children receiving radiation therapy. Pediatric oncology nurses, embedded at every interface of care- from simulation to survivorship- serve as the pivotal translators for dosimetry risk into precision nutrition rescue. Leveraging validated tools, they identify at-risk patients within 48 hours of radiation therapy planning and implement necessary interventions. Implementing of a radiation-specific nutritional pathway, intergrading dosimetric mapping weekly nurse-led reassessments, and multidisciplinary escalation triggers has been shown to reduce unplanned radiation therapy breaks and significantly improve event-free survival. By mitigating malnutrition's compounding effects, this nurse-driven frame not only enhances

treatment fidelity but directly decreases treatment-related mortality, transforming a modifiable risk into a therapeutic level for cure.

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