

The Role of the Dietitian on PICU



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Paediatric critical illness is characterised by significant metabolic and endocrine changes.^{1, 2} As a result, children admitted to the paediatric intensive care unit (PICU) are at an increased nutritional risk. Nutritional status on admission to PICU, including under or over-nutrition, is associated with worse patient outcomes. Inadequate and/or inappropriate nutrition on PICU is also associated with detrimental patient outcomes, including prolonged admission to PICU, difficulty weaning mechanical ventilation support, and an increased morbidity and mortality risk.¹⁻⁴

As a member of the PICU multidisciplinary team (MDT), the dietitian plays an important role in ensuring optimal nutrition provision and support to enhance recovery from critical illness and reduce nutritional complications, including malnutrition and loss of lean body mass.^{2, 4, 5}

Understanding the role of the dietitian on the PICU^{2, 6, 7, 8, 9}

In 2020, the European Society of Paediatric and Neonatal Intensive Care (ESPNIC) published a position statement detailing recommendations for nutrition support on PICU.² In the same year, another paper was published with provided guidance on implementing these recommendations on PICU, which also outline the role and responsibility of the dietitian.⁶

The key responsibilities of the dietitian are to complete a nutritional assessment, determine goals for nutrition support, and provide a plan for nutrition intervention. These are to be carried out throughout admission to PICU, starting at admission date until discharge.

Nutritional assessment includes assessment of anthropometry, biochemistry, clinical and diet history. This assessment is used to determine the nutritional goals, requirements and plan specific to the patient. The phase of critical illness (acute, stable, recovery), fluid restriction, and additional factors that may impact nutrition provision, are considered when determining nutritional goals and interventions. Each of these responsibilities are outlined:

Anthropometry

On admission, anthropometrical measurements are taken and plotted on appropriate growth charts (World Health Organization or national growth charts). Measurements include weight, length under 2 years of age, and height and BMI over 2 years of age. Z-scores are recommended to be used to assess baseline nutritional status, and identify nutritional risk, including under or over nutrition. Anthropometrical measurements should be measured weekly to fortnightly, and at the point of discharge.^{2, 6, 7}

Biochemistry

Biochemistry relating to organ function is monitored throughout admission. It is also advised that in the presence of growth failure at the point of discharge, nutritional bloods are to be measured.

In practice, biochemistry is used to guide decisions for nutrition provision from enteral and parenteral nutrition (PN). It also supports decisions around the choice of feed based on organ function.

The dietitian will take into consideration the impact of critical illness and inflammation on the validity of biochemical nutritional markers. Serum vitamin and trace element levels may be impacted, so interpretation, especially of low levels, should be done so with caution.⁸

Clinical assessment

A full clinical assessment is completed on and throughout admission. This assessment is used to determine the phase of critical illness and identify potential barriers to nutrition provision.

In practice, the clinical assessment involves assessment of ventilation support, inotrope support, drug administration including electrolyte replacement, gastrointestinal (GI) function and fluid status.

Diet history

On the first day of admission, a diet or feeding history of the patient should ideally be conducted with the caregivers present. This initial assessment is used to determine nutritional goals and identify potential underlying nutritional risks, such as refeeding syndrome.

Throughout admission, nutritional intake is monitored and assessed. The assessment involves confirming if feeding has been initiated, calculating nutritional deficits, identifying any barriers to nutrition provision, and agreeing a plan for route of feeding and the most suitable feed choice to ensure nutritional needs are met.

Nutritional requirements

Nutritional requirements are determined based on the phase of illness. The recommendation for calculating energy requirements is to make use of indirect calorimetry, however in the absence of an indirect calorimeter, calculation of resting energy expenditure (such as Schofield Equation) with or without the addition of stress factors is recommended.^{2, 6, 10, 11} Recalculation of requirements is essential to prevent nutritional decline as patients transition between the three phases of illness.

A key nutritional goal in paediatric critical illness is to maintain a positive nitrogen balance through adequate protein provision. For enteral protein, a minimum target of 1.5 g/kg/day is advised.⁴

There is limited evidence to support additional micronutrient supplementation on PICU unless a true deficiency is present; however meeting daily recommended intakes normal for age is advised.⁸

Enteral & parenteral nutrition

On completion of the nutritional assessment and once nutritional goals and requirements have been decided, a plan for nutrition provision can be determined. It is important that the nutritional plan also takes into consideration macronutrient provision for intravenous fluids, drugs infused in lipid emulsions, as well as nutritional losses – for example, those which may occur in patients on renal replacement therapy or with high output stomas.

Early enteral nutrition, ideally within the first 24 hours of admission to PICU, is recommended in the absence of contraindications to enteral feeding. A stepwise approach to increasing enteral feeds to target is advised. The route and choice of feed is patient specific. However, where appropriate, a polymeric enteral feed should be the first choice, and post-pyloric feeding can be considered if gastric feeding is contraindicated.^{2, 6, 10}

Parenteral nutrition (PN) may be considered if enteral feeding is unsuccessful, insufficient or contraindicated. It is advised that withholding PN for the first week of admission to PICU should be considered, as identified by the PEPaNIC trial.^{2, 6, 9}

PN prescriptions should be determined by the nutrition team, which includes the dietitian, and should be monitored daily in unstable patients. Reinitiating enteral feeds and PN weaning should be supported and monitored by the dietitian, to ensure nutritional goals are achieved.

Nutrition support post PICU admission

During the recovery phase of critical illness, which is characterised by patient mobilisation, energy requirements may be 1.5-2.0 times resting energy expenditure (REE) and protein requirements higher. This is to support rehabilitation and recovery of the potential nutritional losses experienced during critical illness. Nutrition support should be provided to patients returning to oral intake, and it is recommended that enteral feeding continue until the patient is able to meet three quarters of their nutritional requirements from food. Some patients may also experience functional changes, such as for those who have had a prolonged period of ventilation or for those who have required extracorporeal membrane oxygenation (ECMO), so referral to a speech and language therapist to support oral feeding is recommended.¹⁰

As previously mentioned, micronutrient status should be monitored in those presenting with growth failure, and supplementation should be started only if serum micronutrient levels are low. Onward dietetic follow up, especially those requiring catch up growth, may also be considered.^{6, 8}

Dietetic provision on PICU

In 2023, a multicentre survey was conducted assessing dietetic input on PICU in the UK and Ireland.¹² This survey aimed to compare the current dietetic staffing levels on PICU to the recommendations set out by the Paediatric Critical Care Society (PCCS), being a ratio of 1:10, dietitian:PICU beds. This survey found that most PICUs in the UK and Ireland have funded dietetic time (92.8%). For those PICUs with dietetic funding, the average dietitian to PICU ratio was 1:22.5 ± 11.7, which does not meet the PCCS recommendation. With inadequate or absent dietetic presence on PICUs, there is a potential increased risk for worsened PICU outcomes secondary to undernutrition during PICU stay. These results highlight the importance of increasing support for the dietitian interested in exploring PICU dietetics to expand our workforce, as well as implementing the ESPNIC recommendations for standardised care, which includes development and implementation of feeding protocols.²

Summary

Throughout admission to the PICU and up to the point of discharge, the dietitian holds responsibility for monitoring and optimising nutrition provision and ensuring that nutritional goals are met. It is also the role of the dietitian to provide nutrition focused education, training and support to those involved in the care of children admitted to PICU. Finally, the dietitian's responsibility for the development and implementation of nutrition protocols, as well as engaging in multidisciplinary working, are vital to ensure patient-centred care and standardised practice.^{2, 6} It is clear that the dietitian plays a vital role in the care of critically ill children admitted to PICU, and in supporting recovery following discharge from PICU.

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