A Review of Enteral Nutrition Practices in Critically Ill Adults in Resource Limited Environments

Abstract

Enteral nutrition in critical care is a complex area of practice. A resource limited environment includes countries that are identified as low-income and low- middle income. This review describes three themes for its successful implementation of enteral nutrition in a resource limited environment. These include identification of patients at risk of malnutrition, using non-commercial feeds and the urgent need to develop practice. Malnutrition is a serious complication of critically illness and remains a crucial aspect of patient care in order to prevent complications. Further evidence to develop sustainable EN strategies for critically ill patients is urgently required. This is a paper commissioned as a part of the Humanitarian and Disaster Relief Operations special issue of BMJ Military Health.

Key Messages:

- The importance of nutrition in the critically ill is well defined within the international literature, however, there is limited information regarding enteral nutrition practice in resource limited settings.
- In resource limited settings, access to commercial enteral nutrition may be limited, therefore solutions to develop low-cost, highly sustainable solutions needs to be sought.
- Critical care services in low and low-middle income countries are becoming increasingly accessible, however, nutritional practices in this setting remains unclear.

Introduction

Current international guidelines recommend nutritional support should be commenced unless contra-indicated within 48 hours of injury or admission to a critical care unit.[1] Nutritional support via a nasogastric or orogastric tube is an easy intervention which can be initiated in all critical care settings. This review was conducted as part of an international partnership project to develop and evaluate a low-cost, highly sustainable EN regimen for critically ill patients in a tertiary referral hospital in sub-Saharan Africa and the findings may be of relevance to humanitarian and military organisations working in resource limited settings. This is a paper commissioned as a part of the Humanitarian and Disaster Relief Operations special issue of BMJ Military Health.

In critical care settings, EN involves using a liquid feed usually via a nasogastric or orogastric tube, which is inserted either into the stomach or post-pyloric.[2] It is a cause for concern that often committees developing international best practice guidelines have limited representation from low-resource settings, with the assumption that their recommendations are transferrable into all settings. However, it is important to note, that evidence from high income settings may not translate to resource limited critical care settings, due to varying case mix, differing models of care, hospital size and country income.[3] Indeed, evidence from the international consensus recommendations for other conditions such as sepsis care, has revealed that implementing inappropriate standards can have harmful effects.[4-7]

Critical care nutrition is a complex area of practice and in resource limited environments, there are added challenges due to the limited availability of commercial feeds. In consequence, there is urgent need to appraise the current evidence around EN practices in critically ill adult patients for resource-limited settings. Therefore, in this review of the literature, the term ‘resource limited’ has been applied to the countries designated as either a low-income country (LIC) or a low-middle income country (LMIC).[8]

In humanitarian situations, the importance of EN in critically ill patients has been identified in several international documents, however, these documents do not provide specific information on how to provide EN.[9-10] A review of the literature shows a paucity of evidence relating to EN practices in this complex area of practice (table 1). However, some themes were identified from the literature including risk assessment screening tools used to identify patients at risk of malnutrition, use of non-commercial feeds and the urgent need to develop practice.

Table 1: Literature pertaining to enteral nutrition in the resource limited environment and implications for practice

Author's details	Year of publication	Country	Study Design	Purpose / aim	Results / Findings	Implications for practice
Barcus GC. [11]	2021	Malawi	Audit of critical care patients in two public tertiary referral hospitals	To determine change in dietary intake combined with disease and mid-upper arm circumference (MUAC) measurement.	Prevalence of identified moderate and severe malnutrition was 62%. Highest rates of poor dietary intake were in patients with organ-related diseases (71.4%) and infectious diseases (57.9%). No association between reported dietary intake and MUAC. Patients unable to eat, the rate of severe malnutrition was 50%. Review of hospital nutrition identified a daily gap in calories and protein.	Importance of developing nutrition and dietetic support for critically ill patients. Importance of using malnutrition tools in critical care. Importance of EN in patients nil by mouth or with reduced oral intake.
Dixit SB.[12]	2021	India	Scoping Review	To establish an independent association between malnutrition and poorer clinical outcomes	Nutritional assessment and requirements. Choosing and initiating EN or PN at the right time. Importance of macro and micronutrients	Potential use of telemedicine to share practices between HIC and LMIC critical care units. Developing strategies for the patients to include nutrition needs post-discharge More data needed.
Zaw HMM.[13]	2020	Myanmar	Cross-sectional pilot study	To describe an overview of the current situation of enteral nutrition practices among people with neurological problems in Myanmar	BMI assessment: • 56.7% normal • 10% were underweight • 30% were overweight	Energy and protein intakes were low. Use of evidence-based nutritional guidelines, assessments.

					• 3.3% were obese. EN included commercial feeds and combination of commercial and other foods. None of them made use of blenderized diets for feeding. Total energy and protein intakes of all participants were found to be inadequate	Effective nutrition care therapy needed.
Dixit S.[3]	2020	India	Review	To identify if evidence generated in developed countries can be adapted into clinical practice of developing countries.	Nutritional assessment Macro and micronutrients availability Enteral nutrition Parental nutrition	Nutritional assessment Macro and micronutrients Evidence generated in HIC appropriate for all settings.
Demeke Y.[14]	2019	Ethiopia	Systematic Review	To develop evidence-based clinical practice guidelines for nutrition support in critically ill adult patients admitted in intensive care unit.	EN is preferred to Parental Nutrition. Recommend use of a standard, polymeric enteral formula that is initiated within 24 to 48 hours after admission to ICU. Patients be cared for in the semi recumbent position	Use of local sourced ingredients to create EN. Nursing considerations when feeding.

Identifying patients at risk of malnutrition

Assessment tools such as the Nutritional Risk in the Critically Ill (NUTRIC) are validated, however, they have not been used widely in resource limited environments. In addition, NUTRIC requires an APACHE II Score, which has not been calibrated to take account of demographics in a resource limited environment. It is important to note, that even in HIC, APACHE II tools have had to be re-calibrated twice in order to take account of differences in patient demographics =.[15, 16] In addition, Haniffa et al point out that the use of APACHE II in resource limited settings is unrealistic due to the amount of data that needs to be gathered, the huge administrative burden required with data input, ongoing training requirements needed of clinical staff and incomplete data sets due to missing information or laboratory results, making it impossible to use this tool consistently.[17]

The use of anthropometric measurements to calculate Body Mass Index (BMI) provides an objective assessment and screening tool. However, as Barcus et al. point out, it was not possible to weight patients as standard hospital beds used in critical care do not have weighing scales.[11] Therefore, an alternative method which has been successfully used in low-resource settings since the 1990s is the mid-upper-arm circumference (MUAC).[18-20] More recently, MUAC has been successfully used in resource limited environments as a malnutrition screening tool for both hospitalised and critical care patients.[18, 21, 22] Barcus et al's (2021) audit of nutritional status of critically ill patients in Malawi used MUAC to determine malnutrition and found 62% of adult critical care patients had moderate to severe malnutrition.[11]

However, it is important to note, the WHO identifies that in some countries there are differing professional roles for example, for dieticians and nutritionists.[23] They may complete similar training, but not necessarily have the same functions in practice. In addition, it is a cause for concern that in many countries in Africa, the availability of nutritional professionals is very limited, and may be focused on responding to other health inequalities such as child malnutrition. [23] Nurses are the backbone of critical care services in Africa, where there are limited doctors and allied health

professionals such as Dieticians. In consequence, critical care nurses are in a privileged and unique position to lead on the nutrition of critically ill patients. However, it is accepted that with a limited workforce, it may not be possible complete comprehensive nutritional assessments. In addition, Van Tonder et al., South African study, identified that nurses lacked confidence when calculating body mass index (BMI) and percentage body weight.[24] They argue that screening tools need to be quick, easy to follow, require limited resources and linked to training and support in practice.

Calculating Nutritional Requirements and Practices

Critically ill patients have a high metabolic rate resulting in a higher rate of muscle wasting. Although EN attempts to reduce the losses it cannot be completely stopped. In consequence, individualised feeding regimens need to be based on several factors, including the calorie per kilogram (calorie/kg), the stage of illness, condition and the type of treatment provide. Individualised EN regimes may include a relatively low calorie/kg during the early stages of critical illness (20-25kcal/kg/d), with the aim to meet protein requirements of around 1.3-1.5g/kg/day, depending on renal function. However, in ventilated patients, obtaining kcals from carbohydrate may lead to a longer weaning time.[2]

All the studies identified in this review identified the challenges in using commercial EN and discussed the use of locally sourced ingredients which are blended as a way to provide EN.[3, 14]However, only Zaw et al. and Barcus et al identified there were gaps in calories and protein intake in their locally sourced feeds.[11, 13] Demeke et al provided a comprehensive breakdown of locally sourced ingredients which also had high protein content.[14] Dixit et al. further discussed the importance of micronutrients such as zinc and vitamins.[12] This was supported by Hoeger et al., who identified zinc as an essential micronutrient and persistent low levels may be a biomarker in the diagnosis and evaluation of sepsis patients.[25] In low-resource settings the burden of sepsis is high.[26]

Dixit et al also identifies the importance of developing nutritional strategies for patients' post-discharge from critical care, as they may have poor oral intake and/or continue to require EN.[12] An

advantage to using blended locally sourced ingredients may be increased sustainability for hospitals and families. However, further research is urgently needed in this field of practice.

Developing Practice with Limited Evidence

Critical care services are becoming increasing common place within hospitals throughout the region; however, their reported mortality rates are often considerably higher when compared to HIC.[27-29] Given the increasing availability of critical care services in stable low-resource settings and the differences in outcomes, it was a cause for concern, the limited number of published studies in these settings.

While there may be many contributing factors to a higher mortality, it is important to note that studies regardless of setting, have shown that patients at nutritional risk have higher rates of infection, complications including malnutrition, delayed wound healing, increased mortality, and longer hospital stay and suffer from organ failure .[1] In consequence, in the absence of evidence or documentation on this area of practice, malnutrition which occurs during critical illness may be a silent contributing factor.

In the light of the paucity of evidence identifying, developing and evaluating EN practices, Dixit et al suggested the use of telemedicine in order to share knowledge and ideas between HIC and low-resource settings.[3] In addition, the Covid-19 pandemic led to a rapid increased use of virtual collaborations, which should facilitate exchange of information to support those working in resource limited settings.[3] While this approach may provide expert technical advice for humanitarian and military organisations deployed in a range of settings, access to a continuous supply of commercial feeds may be a challenge. Therefore, developing a low cost, highly sustainable enteral nutrition for critically ill patients, may be of benefit when treating local nationals or when providing prolonged field care.[30, 31] Previous UK military operations have required local nationals to be transferred to other local facilities when stable, therefore an added advantage of developing locally sourced enteral nutrition regimens may allow continuing in care.

Recommendations or implications for practice and/or further research

Early versus delayed EN in critically ill patients remains controversial and the evidence is in-conclusive. Malnutrition has been identified as a real risk for patients in resource limited settings, and that malnutrition screening and assessment can be easily performed in low-resource critical care units, by using MUAC. However, it is important that critical care nurses and other healthcare workers are trained in this area of practice and where possible advice from nutritional experts should be sought.

Secondly, in the absence of commercial EN, locally sourced ingredients can be used to provide a low-cost, highly sustainable EN to critically ill patients. However, it important to note that recipes will vary between countries, due to the availability and cost of local ingredients. In addition, local recipes must include ways to increase micronutrients. The challenge here is that when using local EN recipes the nutritional content can only be estimated. Therefore, this approach should be used in conjunction with a malnutrition screening tool and assessment to nutritional professionals either locally or virtually.

Finally, there is urgent need for research, evidence and best practice guidelines in LIC and LMIC settings. Also, that with the increasing availability of critical care services across sub-Saharan Africa, it is now possible for research studies to be conducted. The use of international health partnerships should be considered as a way to provide technical support and sharing of best practice. Using this approach to begin to address this area of concern a research study based in sub-Saharan Africa is in progress.

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