

INTRODUCTION

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The December 2007 edition of this Journal summarised current practice in Combat Casualty Care. It is important to appreciate that the care continues beyond the resuscitation rooms and operating theatres of the field hospital through an evacuation chain that ultimately leads to University Hospitals Birmingham and to the Defence Medical Rehabilitation Centre at Headley Court.

Major trauma, including burns, head injury and multiple injuries, produces a marked catabolic shift in metabolism. While nutrition alone cannot completely compensate for this, early provision of an adequate supply of nutrients has been shown to lower the incidence of metabolic abnormalities, reduce septic morbidity, improve survival rates and decrease the length of hospital stay.

The issue of casualty nutrition was raised at the Joint Theatre Clinical Case Conference in summer 2008 and a requirement was identified to develop an evidence-based feeding policy that commenced in the deployed hospital, continued through the aeromedical evacuation chain (where appropriate) and linked with the feeding policies of the receiving hospital within the

University Hospital Birmingham NHS Trust.

To meet this requirement a multi-disciplinary working group has been established to address this issue, concentrating on four main areas:

- Nutrition of critically ill coalition casualties
- Nutrition of coalition casualties on the wards
- Nutrition during rehabilitation
- Nutrition of host nationals treated in deployed medical facilities

This series of articles reviews the issues related to nutrition of battle casualties in the deployed environment and throughout the medical evacuation chain, up to and including Role 4 care, this includes the need for further research into the risk of aspiration from enteral feeding during Critical Care Air Support Team transfer; the nutritional requirements for host-nation casualties treated in theatre are also addresses. The intention is to provide DMS personnel with an introduction to the benefits and issues around nutrition of combat casualties and encourage people to think 'ABCDE F-Feed'

NUTRITION: WARD BASED ENTERAL AND SUPPLEMENTAL NUTRITION ON OPERATIONS

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Introduction

The beneficial effects of enteral feeding on acute trauma continue to be debated in the literature due mainly to levels of heterogeneity within small scale clinical studies leading to lack of consensus in meta-analyses [1, 2]. There is a general consensus and belief however, that trauma (both acute severe and planned surgical) is the most important factor in increased systemic stress, nitrogen production and requirement for optimal nutrition. Failure of adequate tissue healing due to malnutrition (both pre-existing and ongoing) increases morbidity and mortality and leads to the potential for further surgical intervention and prolonged hospital stay potentially compromising operational bed availability. Data linking poor nutritional state and post-operative complications has been available for many years [3-5]. Ensuring timely, optimal nutritional intervention maximises the probability of speedy recovery and discharge by reducing infectious and non-infectious

post-operative complications, maximising wound healing and improves rehabilitation potential.

Studies have shown the greatest benefit is by appropriate nutritional intervention in at risk patients and that there is little to be gained by enterally or parenterally feeding all-comers e.g. in the ward setting it is not envisaged there would be a need to enterally feed well nourished individuals having planned or semi-elective surgical procedures. The requirement for *ward based* enteral or supplemental feeding on operational deployment for servicemen/women will therefore be uncommon, as length of stay in an operational environment for someone so unwell is short enough for it not to be a significant consideration. However, ITU/HDU patients who are routinely enterally fed will occasionally be transferred to the ward environment prior to aero-medical evacuation, and therefore some understanding of the process is required, as is a clinical guideline to support best practice. Further, operational hospitals are now commonly expected to manage longer stay local nationals who may require intensive surgical and therefore nutritional input into their care. Many of these local nationals are children, from some of the most underdeveloped areas of the world.

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Nutrition in Children

Malnutrition remains one of the most common causes of morbidity and mortality among children throughout the world. The World Health Organization (WHO) developed and published criteria for the classification of severe malnutrition in children in 1999 [6]. The criteria for acute malnutrition are based upon the degree of wasting (weight for height) and the presence of peripheral oedema. Chronic malnutrition is assessed using height for age – all referenced against WHO norms. The child's weight for his or her height and the height for his or her age (or stunting) are expressed as Z-scores, calculated as the observed value minus the median value of the reference population divided by the standard deviation of the reference population. Reference values are from the National Centre for Health Statistics (NCHS) and WHO.

Wasting or stunting is considered severe or moderate if the Z-score for weight-for-height or height-for-age is greater than -3 or between -2 and -3, respectively. Children with symmetrical oedema involving at least the feet are considered to have severe malnutrition. Approximately 9% of children below 5 years of age suffer from wasting indicating malnutrition (weight-for-height below -2 standard deviations (<-2 SD) of the NCHS/WHO reference values) and are at risk of death or severe impairment of growth and psychological development. Alternatively simple anthropometric measures can be used – commonly the mid upper arm circumference (MUAC) [7-9].

In Afghanistan, WHO data [10] reflects that up-to 24% of children under the age of 5 fit into or near this category, moreover, up to 16% of children under 5 are <-3SD on weight for age comparisons (NCHS/WHO reference values). Further evidence from the National Surveillance System Pilot Study and National Risk & Vulnerability Assessment [11] conducted on behalf of the Afghanistan Government, NGO's and UN in Afghanistan 2003-4, showed that in the survey area, up to 9.17% of children aged 6-59 months met the criteria for severe or moderate acute malnutrition. Moreover, chronic malnutrition is estimated at between 45% and 59% in children aged 24 – 59 months.

It is likely therefore, that operational hospitals will be required to deal with undernourished or malnourished children from time to time and, very occasionally, severely malnourished. Relevant policies and skill sets should be identified and be in place to enable effective nutritional management at best practice levels, ensuring optimal outcome of interventions for these individuals whilst in our care. It is acknowledged that little impact will be made to the long term nutritional status of these patients, but rather adequate short to medium-term inpatient (enteral) nutritional supplementation is advocated to ensure optimal nutritional intervention ensuring recovery from injuries/surgery and leading to quicker, safer discharge.

Nutritional assessment on the ward

The starting point of good nutritional care is a full nutritional assessment, using WHO reference values as the norm [6]. All local national children and adolescents admitted to an operational hospital should undergo an appropriate nutritional assessment – at the very least comprising height, weight and MUAC. An as accurate as possible determination of age is crucial to this assessment and is acknowledged in some operational areas as being difficult. Once a patient is identified as undernourished, malnourished or severely malnourished, a careful nutritional plan should be designed for that individual, taking into account the adequate provision of a nutritionally complete diet, whether that be in the form of a controlled meal service, supplemental feeding or enteral feeding as well as the monitoring needs to ensure safe outcomes of such an intervention. A three step approach should be adopted in the provision of optimal nutrition.

Nutritionally Complete Hospital Meal Service

Operationally this is provided by the Master Chef, and effective communication of needs, requirements and rationale is an essential prerequisite. The Master Chef should be formally tasked to provide such a service and as necessary be given the tools and skill sets to do so. In most situations this will be all that is necessary – however occasions will arise when nutritional assessment identifies individuals in need of either supplemental nutrition or formal enteral feeding.

Supplemental Feeding

This is required when a patient is taking normal diet, but at a level which is inadequate to meet their nutritional needs, and therefore likely compromising their recovery. Nutritional drinks can be added to the diet in order to approach or achieve the appropriate protein and calorie intake. In this situation accurate daily assessment is vital to ensure adequate intake. In those who are unable to take adequate supplements, and in those assessed beforehand as needy of, formal enteral feeding will be required.

Enteral Feeding

This is the complete provision of daily nutritional requirements, in this setting, via an enterally placed feeding tube. This feeding tube can be a temporary or long term tube, placed on the ward or at the time of surgery. Nasogastric/nasojejunal tubes are typically used when the anticipated length of tube feeding is less than 4-6 weeks. If feeding is envisaged beyond this time frame, a surgically placed (PEG/PEJ type) or standard gastric or jejunal feeding tube should be placed at the time of initial surgical intervention. Endoscopic facilities for the placement of tubes are not available in the deployed setting but a surgically placed PEG/PEJ type tube has the benefit of not requiring surgical intervention to remove. There are a variety of feeds available and advice needs to be taken to ensure adequate but not over provision of feeds to operational hospitals.

Ward-based Feeding Issues

Coalition/ISAF Personnel

They are unlikely to provide particular issues in terms of feeding as there are low levels of pre-existing under-nutrition or malnutrition. Enteral feeding started in ITU/HDU would be continued on the ward, but as anticipated length of stay in operational theatre is short, ward based patients would rarely need initiation of enteral feeding prior to aeromedical evacuation. This is also true for contractors and locally employed civilians.

Local Nationals

A full nutritional assessment is required on admission, and grading according to WHO norms essential. A proactive stance should be taken as soon as possible on admission, in order to determine likelihood for the need of supplemental or enteral feeding and the correct method of delivery. As necessary, appropriate feeding tubes can be inserted during primary surgery. Once identified as nutritionally challenged, a full biochemical assessment is needed, and a nutrition plan individualised and incorporated into a nursing care plan to ensure adequate ongoing assessment. The feeding plan for local children at Camp Bastion introduced in June 2008 is shown in Box 1. All patients identified as being nutritionally 'at risk' should have their nutritional care supervised by a named consultant to comply with governance guidelines.

Knowledge of the complications of feeding in malnourished individuals is important, and although rare, an awareness of the re-feeding syndrome [12-15] is crucial. This syndrome is associated with severe hypophosphataemia, hypomagnesaemia and hypokalaemia. Adequate biochemical analysis needs to be

available and monitoring of serum electrolytes daily forms an integral part of the nutritional assessment. Prevention of what can be a devastating complication of well meaning feeding regimens, is essential and generally straightforward, but needs forethought and therefore appropriate training. Availability of intravenous electrolyte and mineral supplementation is important. Guidelines need to be produced to ensure adequate provision of information on this important aspect of nutritional care.

Age	Daily Calorie Requirements
0-5 months	700 kcal
5-12 months	900 kcal
1-3 years	1400 kcal
4-6 years	1800 kcal
7-10 years	2000 kcal
10-14 years	2300 kcal
15-18 years	2500 kcal

Box 1. Enteral Feeding Guidelines for Afghan Children; Camp Bastion June 2008

Some children may be at risk for re-feeding syndrome, but are also injured, thus commence feeding at 60% total daily calorie requirement for 2 days, increase to 80% if tolerated for 2 further days before increasing to full feed. Feeding rate is calculated by volume of feed needed to deliver calorie requirement over the number of hours for feeding. Feeding pumps are not essential as minor discrepancies in delivery rates are rarely of clinical consequence and it takes little time to judge and adjust the rates as necessary.

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