ORIGINAL ARTICLE

Journal of
Clinical Nursing

A European survey of enteral nutrition practices and procedures in adult intensive care units

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Submitted for publication: 15 January 2006
Accepted for publication: 25 August 2006

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FULBROOK P, BONGERS A & ALBARRAN JW (2007) *Journal of Clinical Nursing*

A European survey of enteral nutrition practices and procedures in adult intensive care units

Aims. The aim of this survey was to gain an overview of enteral nutrition practices and procedures of European adult intensive care units and to describe current trends.

Background. Currently, little is known about nutritional practices in European intensive care units and whether they match existing guidelines.

Design. Survey.

Methods. A 51-item questionnaire about nutritional assessment and enteral feeding was distributed to 383 intensive care units in 20 countries.

Results. A total of 380 (99·2%) questionnaires were returned. Most intensive care units (86·5%, $n = 320/370$) did not use a nutritional risk score and 35·8% ($n = 133/371$) conducted daily assessments of nutritional status; body weight and serum albumin were the commonest measures. Checking the position of the feeding tube using auscultation of injected air was widespread (72·6%, $n = 275/373$). Most units used a clinical protocol and under half were supported by a nutritional support team.

Conclusion. There are some variations in enteral nutrition practices across European intensive care units. Involvement of nurses in performing nutritional assessments or developing clinical protocols was minimal. The use of outdated procedures for checking feeding tube placement is a concern. There is scope for further development of nutrition guidelines in European units.

Relevance to clinical practice. This study is relevant to all nurses working in critical care areas. The findings suggest that when an intensive care unit is supported by a

doi: 10.1111/j.1365-2702.2006.01841.x

nutritional support team it is more likely that a nutritional score will be used and nutritional assessments will be made daily. Many intensive care practices do not conform to international guidelines for enteral feeding. Nutritional assessment and the use of nutritional risk scores are areas that would benefit from further application in intensive care. This study may provide an impetus for intensive care units to review their nutrition assessment practices and to advance evidence-based guidelines, developed by multi-professional teams, which ensure the safe and effective management of patients receiving enteral nutrition.

Key words: critical care, enteral feeding, enteral nutrition, Europe, evidence-based practice, survey

Introduction

Providing effective nutritional support (NS) is vital to the comprehensive management of patients in intensive care units (ICUs), particularly as the risk of malnutrition is high (Harrington 2004). Early administration of enteral nutrition (EN) restores intestinal motility, maintains gastro-intestinal integrity and functioning, minimizes the translocation of organisms, improves wound healing, decreases incidence of infections and supports other homeostatic processes. These accrued benefits translate into a reduced complication rate, reduced length of ICU stay and decreased risk of death (Heyland 1998).

Despite this awareness, a series of international studies has shown that, in many ICUs, EN is not started on all eligible patients, there is delayed timing in administration and there are several features having an impact on delivery that may lead to failure in individual feeding targets (Heyland *et al.* 1995, Adam & Batson 1997, McClave *et al.* 1999, Heyland *et al.* 2003a, Roberts *et al.* 2003).

Background

The reported difficulties in optimizing calorific intake in critically ill patients has led the ICU community to identify evidence-based guidelines to develop standards of NS and improve patient outcomes (Adam 2000, Heyland *et al.* 2003b, Roberts *et al.* 2003, Dhaliwal *et al.* 2004, Peter *et al.* 2005). Current recommendations for critically ill patients include the following: patients should be fed preferentially through the enteral route; feeding must be started within 24–48 hours of ICU admission; delivery should be optimized to achieve calorific targets; appropriate formulations should be selected based on the patient's metabolic and immunological status and intolerance must be appropriately managed (Dhaliwal & Heyland 2004). Subsequent studies evaluating the use of evidence-based protocols and guidelines identify improvements in the early initiation of EN, lower duration of mechanical ventilation, decline in the inappropriate use of parenteral nutrition (PN), potential to reduce sepsis-related complications, interruptions in delivery and decreased risk of death (Adam & Batson 1997, Barr *et al.* 2004, Heyland *et al.* 2004, Martin *et al.* 2004, Mackenzie *et al.* 2005). Adam (2000) and Roberts *et al.* (2003) add that ICU nurses play a key role in the timely administration of EN, however, the use of well-designed clinical protocols is vital to standardizing care and improving patient outcomes.

European perspective

Within Europe, only a few studies have examined EN practices in the ICU setting and none has either encompassed a nursing perspective or has studied the role of healthcare team members. Most have focused on specific organizational and clinical outcomes. For example, Planas (1995) and Hill *et al.* (1995) reported that between 20% and 34% of ICU patients received EN. Planas (1995) also reported that the mean time to the administration of EN varied between 3·1 SD 1·6 days. By contrast, Verhage and van Vliet (2002) studied 74 Dutch ICUs and demonstrated improvements in their practice. Nutritional support was administered to 69% of patients, of these 58% received EN and 17% had PN. Enteral feeding commenced after a mean of 1·3 SD 0·1 days after ICU admission and only 29% of patients were without NS after a mean admission period of 1·6 SD 0·1 days.

The European Society of Intensive Care Medicine conducted a multi-national study to describe the practical aspects of nutritional management in ICU across Europe (Preiser *et al.* 1999). A 49-item questionnaire was posted to 1608 physicians representing 35 countries. Only 271 questionnaires were returned, giving a response rate of 17%. Measures used by physicians to indicate the nutritional status of patients included clinical evidence and biochemical markers (99% and 82% respectively). The use of functional and immuno-

logical measures was rare. Of the 2774 patients included in the study, 58% were enterally fed and 19% received total parenteral nutrition. In 47% of cases, EN commenced within 48 hours of ICU admission. Nutritional Support Teams (NSTs) were present in 29% of hospitals and in 68% of these an ICU physician was involved. Ninety-five per cent of units used auscultation and/or 65% an abdominal X-ray to confirm location of the nasogastric tube (NGT). These results confirmed a trend in improvements in NS compared with earlier studies, however, the response rate of 17% limits any generalization of these findings.

This analysis of medical and nursing literature suggests that there is a widespread adoption of clinical practice guidelines and protocols to improve the efficiency in the delivery of NS including outcomes of critically ill patients. However, to date, within the European community, there have been no published studies that have explored specific adult ICU practices and procedures in relation to undertaking nutritional assessments, nutritional risk score (NRS) and other related activities, such as NGT placement and the use of clinical protocols.

Aim

The study aim was to gain an overview of EN practices and procedures of European adult ICUs and to describe current trends. The data for this paper emerged from a large multinational study which was conducted with the purpose of describing intensive care nutritional practices in 20 European countries. The study was exploratory and was not designed to infer generalizations. Nonetheless, information generated from this study is helpful in identifying nutrition practices that are non-existent, inconsistent or are not research-based and may provide a useful impetus for multi-professional teams in some European ICUs to review and, where necessary, revise their enteral feeding practices.

The paper presents the findings from the first part of the study, which was designed to address the following questions:

- What are the current EN practices within European ICUs with respect to NRS, nutritional assessment, NGT placement, use of protocols and NSTs?
- Are there any variances in EN practices with respect to: (a) country of practice and (b) type of hospital?

Methodology

The study used a survey design: data were collected by postal questionnaire. For the purpose of the survey, the following operational definitions were given:

- Adult ICU: those units admitting patients aged 16 years and above;
- Enteral feeding: the administration of nutrients by tubes or other devices direct into some part of the gastro-intestinal tract (Payne-James 2001).

A 51-point questionnaire, divided into three distinct sections was used for the main study. General information was collected about the size of each hospital and its ICU, how many and what type of patients were admitted and some elements of staff skill-mix. Eleven questions addressed three areas: risk assessment, nutritional status and nutritional requirements. A further 26 questions were concerned with different aspects of enteral feeding. Some questions required the respondent to select only one response, whereas others enabled the respondent to make multiple selections. Other questions required a numerical or worded response. This combination of questions is a usual feature of a survey (David & Sutton 2004). Nurses were asked to respond to questions about EN practices and procedures in their own ICU. With the exception of overall responsibility for assessment of nutritional status, the questionnaire did not require respondents to identify which healthcare professional was responsible for carrying out the various procedures and practices.

Sample

A convenience sample of critical care nurses representing 20 countries of the European federation of Critical Care Nursing associations (EfCCNa) was invited to participate in the study. With the exception of Iceland which only has three ICUs, all representatives were asked to distribute 20 questionnaires ensuring a broad geographical spread in their country. Each participating ICU received one self-administered questionnaire for completion. A total of 383 survey questionnaires (a copy of the questionnaire is available from the first author (PF) upon request) were distributed (see Table 1).

Data collection

Senior nurses from participating units received the questionnaire with a covering letter, on headed paper, presented in their own language, which outlined the purpose of the study and that participation was voluntary. Such measures help to reassure respondents about the integrity of the organization and the research team (Bowling 2002). Data were collected over a six-month period during 2003.

Data analysis

Data were analysed using the Statistical Package for Social Scientists (SPSS, SPSS Inc., Chicago, IL, USA). Descriptive statistics, parametric and non-parametric tests of difference

Table 1 Distribution of sample

Region of Europe	Total no. of participating intensive care units	State/public hospital		Private hospital	
		Frequency	%	Frequency	%
Northern: Finland, Denmark, Iceland, Norway, Sweden	80	78	97·5	0	0
Western: Austria, Belgium, Germany, Switzerland, The Netherlands, UK	120	96	80·0	18	15·0
Eastern: Croatia, Hungary, Poland, Slovenia	80	78	97·5	1	1·3
Southern: France, Greece, Italy, Spain, Turkey	100	93	93·0	7	7·0

and non-parametric tests of correlation were applied as appropriate. Where variables were categorical or ordinal, a non-parametric test was used to examine difference (χ^2). Yates correction was made for 2 × 2 tables. Spearman's Rank Order Correlation (rho) was used to calculate the correlation coefficient (r_s) and significance of ordinal variables. Analysis of variance (ANOVA) was used to examine differences between multi-factorial variables. Because the results were not intended to change practice, significance was set at $p < 0{\cdot}05$.

Validity and reliability

The content of the questionnaire was based on evidence from the literature and the authors' clinical experience, factors which can add to the reliability of a survey (David & Sutton 2004). Registered translators prepared the questionnaires in 14 languages. The questionnaire was then reviewed for issues of linguistic accuracy, clarity of technical terminology, internal consistency and content validity, by EfCCNa representatives and nutritional experts from industry who were fluent in the 14 languages. The questionnaire was not piloted as this was considered unnecessary because it was collecting factual data.

Ethical considerations

Ethical approval for the study was granted by the EfCCNa Council. Consent was implied by respondents by their decision to return the completed questionnaire. All participants were advised that all data would remain anonymous, kept confidential and stored safely.

Results

Sample

A total of 380 (99·2%) questionnaires were returned, although not all were complete. The sample was spread across the whole of Europe (see Table 1); 90·8% ($n = 345$) of hospitals were state/public hospitals. Approximately half of the sample was based in a university teaching hospital (48·7%, $n = 185/380$) and half was based in a non-university hospital (46·1%, $n = 175$). More than one-third of hospitals had more than 600 beds (36·8%, $n = 140$). Geographically, there were significant differences in the size of hospitals ($p = 0{\cdot}003$, df = 3). Eastern European hospitals were largest (mean 892 beds, SD 792), followed by Southern Europe (mean 752, SD 523), Western Europe (mean 648, SD 439) and Northern Europe (mean 567, SD 333).

Teaching hospitals were significantly larger (mean number of beds = 977) than other hospitals (mean number of beds = 460) ($p \leq 0{\cdot}001$, $t = 9{\cdot}387$, df = 311). The number of ICU beds per hospital ranged from 4 to 174 beds (mean 23·9; mode 8). Around a third of hospitals (34·7%, $n = 132$) had 10 or less ICU beds (see Fig. 1) and the size of the hospital correlated strongly with the number of ICU beds ($r_s = 0{\cdot}76$, $p < 0{\cdot}001$).

A ratio of one ICU per hospital was common (40·3%, $n = 137$), with a majority of hospitals (59·7%, $n = 203$) having more than one ICU on site (mean 2·8). Most ICUs (56·6%, $n = 215$) were described as 'general', with the next largest category being 'surgical' (13·2%, $n = 50$). The largest group of patients admitted to ICU was described as 'surgical'

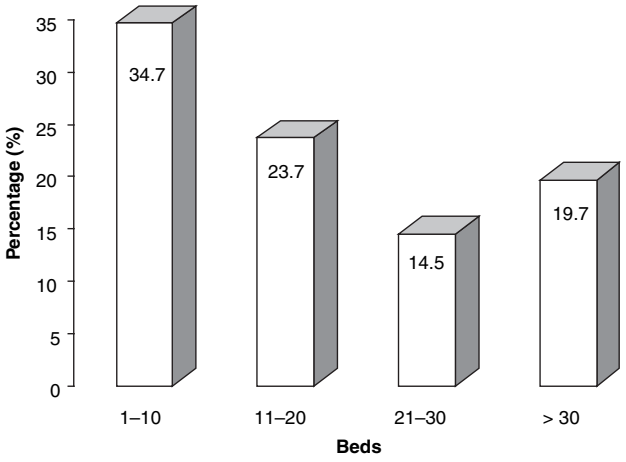

Figure 1 Number of intensive care units beds per hospital.

(25·8%). The mean number of patients admitted to each ICU per year was 750 SD 594 (range 8–4900). The mean number of patients per ICU bed per year was 77·3 (SD 55·7, median 62·5, mode 50). In most ICUs the senior manager was a physician (72·6%, $n = 265$) and in only 24 (6·6%) units was the senior manager a nurse. Of the 241 ICUs that held data, the mean length of stay of patients was 5·5 days (SD 3·5).

Nutritional assessment

Risk assessment

The vast majority of ICUs (86·5%, $n = 320/370$) did not use a NRS to assess their patients. Of units that used a scoring system at least 14 different scores were identified. However, of the 44 ICUs that used a NRS, the majority (63·6%, $n = 28$) were unable to identify it by name. Of the ICUs supported by a NST only 27·6% ($n = 37/134$) used a NRS. This is in significant contrast to the 5·6% of ICUs using a NRS that were not supported by a NST ($p \leq 0{\cdot}001$, df = 1). There was no significant difference between university (17·8%, $n = 27/152$) and non-university hospitals (14·8%, $n = 22/149$) with the use of a NRS.

Nutritional status

The questionnaire offered 14 commonly used measures of nutritional status and respondents were asked to identify all measures used in their ICU. The most commonly used measures (used alone or in combination with other measures) were body weight and serum albumin. There were over 250 variations in practice, of which the most commonly reported are shown in Table 2.

Nutritional status of patients was usually assessed on a daily basis (35·8%, $n = 133/371$), with 18·3% ($n = 68$) of units assessing every 2–3 days and 11·6% ($n = 43$) assessing weekly. However, many units (28·3%, $n = 105$) made assessments randomly and 5·9% ($n = 22$) never assessed patients. There was no significant difference between university and non-university hospitals in the frequency of assessment, with around one-third assessing on a daily basis (35·5%, $n = 65/183$ and 35·5%, $n = 60/169$ respectively). However, there was a significant difference ($p < 0{\cdot}001$, df = 4) in the frequency of assessment by ICU's supported by a NST, with nearly half (45%, $n = 60/133$) assessing nutritional status daily. In most ICUs (73·6%, $n = 262/356$) a physician was responsible for assessing nutritional status. Most often the physician was an ICU intensivist (44·4%, $n = 158$). In a small number of ICU's, the nurse (5·9%, $n = 21$) or dietician (3·9%, $n = 15$) was responsible. In 51 (14·3%) units the assessment was made multi-professionally.

There was no significant difference between university and non-university hospitals with the professional responsible for making nutritional assessments, with the majority of assessments being made by ICU intensivists (43·1%, $n = 75/174$ and 48·1%, $n = 79/164$ respectively) and anaesthetists (22·4%, $n = 39/174$ and 22·0%, $n = 36/164$ respectively). The professional responsible for making nutritional assessments was similar, whether or not the ICU was supported by a NST, with ICU intensivists making most decisions (41·8%, $n = 56/134$ and 45·8%, $n = 97/212$ respectively).

In units where an ICU intensivist was responsible for assessing nutritional status, assessments were most often made randomly (34·2%, $n = 53/155$) or daily (31·0%, $n = 48/155$) and only 13·5% ($n = 21/155$) used a NRS.

Naso/oro-gastric/jejunal tube placement

The most common route of enteral feeding was via a NGT (84·5%, $n = 239/283$). Several types of NGT were used: polyurethane (49·1%, $n = 159/324$), silicone (29·0%, $n = 94$) and polyvinyl chloride (20·4%, $n = 66$). A variety of methods was used to check the position of the feeding tube following insertion. The most common method was auscultation of injected air (72·6%, $n = 275/373$) followed by abdominal/chest X-ray (34·9%, $n = 130$). Many ICUs (45·3%, $n = 169$) used more than one method in combination. Other methods used were the presence of bile in the aspirate (30·5%, $n = 114$) or pH measurement of aspirate (5·6%, $n = 21$). Following insertion, feeding tubes were changed randomly in most ICU (51·0%, $n = 184/361$) and in some units they were never changed (11·9%, $n = 43$). Many nurses were unable to identify how frequently the tube was changed, although there was a range of practices (see Table 3). Most naso/oro-jejunal tubes were inserted either blindly and then checked by X-ray (44·2%, $n = 140/317$) or endoscopically (34·1%, $n = 108$).

Use of feeding protocols

The majority of ICUs (75·7%, $n = 280/370$) had a protocol or guideline for enteral feeding. However, there was a

Table 2 Measures of nutritional status ($n = 380$)

Measure (used alone or in combination)	*n*	%
Body weight	262	68·9
Body mass index	128	33·7
Weight loss/gain	133	35·0
Weight for height	93	24·5
Serum albumin	227	59·7
Serum prealbumin	62	16·3
Serum C-reactive protein	121	31·8

Table 3 Frequency of feeding tube change

Frequency of feeding tube change	*n*	%
Every 1–3 days	7	1·9
Every 4–7 days	42	11·6
Every 8–14 days	26	7·2
Every 15–21 days	18	5·0
Every 22–42 days	15	4·2
Regularly (unspecified)	13	3·6
When necessary (unspecified)	6	1·7
Randomly (unspecified)	184	51·0
Never	43	11·9

significant difference according to geographical regions ($p < 0{\cdot}001$, df = 3). Most Northern ICUs (88·1%, $n = 67/76$) had protocols, compared with Southern ICUs (81·3%, $n = 78/96$), Western ICUs (74·5%, $n = 89/119$) and Eastern ICUs (41·8%, $n = 46/79$). In most units the protocol/guideline had been developed by a doctor (54·2%, $n = 141/260$), of whom most were ICU intensivists (35·0%, $n = 91$). A number of protocols were developed by ICU nurses (21·2%, $n = 55$) or multi-professionally (16·2%, $n = 42$). A large number of respondents failed to answer this question (31·6%, $n = 120$).

Nutritional support teams

A minority of ICUs were supported by a NST (36·1%, $n = 137/370$) although significantly more university teaching hospitals (45·3%, $n = 82/181$) than non-university teaching hospitals (27·6%, $n = 47/170$) provided this service ($p = 0{\cdot}001$, df = 1). There was no significance in the availability of NSTs according to geographical region, with only Western Europe having NSTs in more than half of the ICUs.

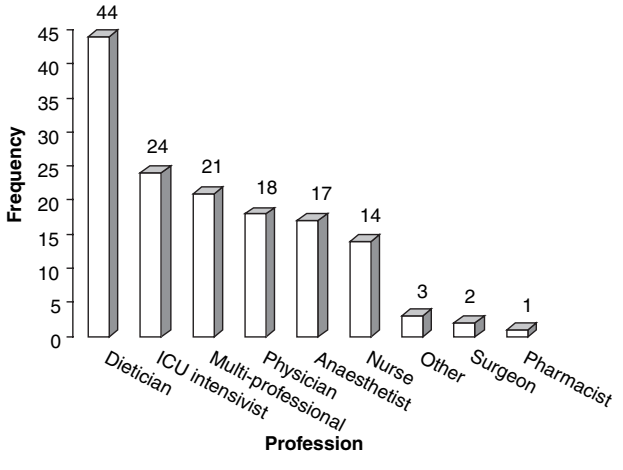

Figure 2 Profession of person leading nutritional support team ($n = 144$).

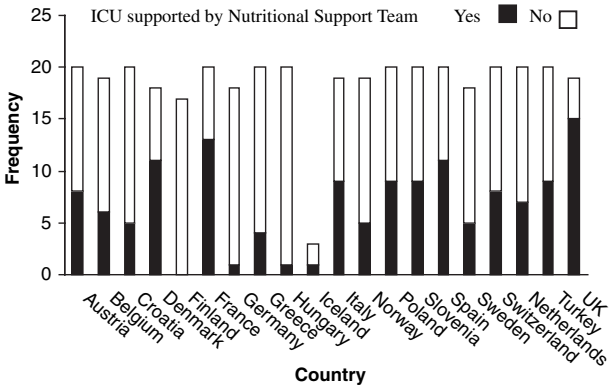

Figure 3 Nutritional support team by country.

Where NSTs existed, they were either led by doctors (42·4%, $n = 61/144$) or dieticians (30·6%, $n = 44/144$) (see Fig. 2). Only four countries had more than half of the ICUs supported by a NST (see Fig. 3).

Discussion

To our knowledge, this study is unique in that no other research has explored the enteral nutritional practices and procedures of European adult ICUs to this extent. The use of a multi-lingual questionnaire and sampling approach make this study distinctive from other published international work in this area. Indeed, our response rate of 99·2% was extremely high when compared with previous work, which ranged from 17% to 66% (Hill *et al.* 1995, Planas 1995, Preiser *et al.* 1999, Verhage & van Vliet 2002). One explanation is that the translation of the questionnaire had a significant impact on return rates. Additionally, as EfCCNa representatives used their personal contacts to distribute the questionnaires this might account for the high positive response rate. It is also acknowledged that this may also have led to some biases in the sample selection.

Most of the respondents practised in public hospitals, with half based in university teaching hospitals (48·7%, $n = 185/380$) or in non-university hospitals (46·1%, $n = 175$). The distribution of university teaching hospitals and ICU beds per hospital is consistent when compared with earlier surveys (Preiser *et al.* 1999, Verhage & van Vliet 2002). The major differences between university teaching hospitals and non-university institutions, was in the availability of NSTs. This was significantly higher in the former than the latter (45·3% and 27·6%, respectively) ($p = 0{\cdot}001$, df = 1). Our data suggest that, as the last European nutritional survey (Preiser *et al.* 1999), there has been only a small increase in the availability of NSTs across Europe, despite it having supporters (Jonkers *et al.* 2001).

Risk assessment

Only 13·5% ($n = 50$) of units used a NRS to assess their patients and even in ICUs supported by a NST, this was low (27%, $n = 37$). As the questionnaire guidelines did not provide a definition of NRS this might explain the low level of stated use and a failure to identify them by name. However, none of the studies reviewed above (Hill *et al.* 1995, Planas 1995, Preiser *et al.* 1999, Verhage & van Vliet 2002) described performing an assessment of risk. It might be argued that NRSs are unhelpful in ICU as all critically ill patients are at risk of malnutrition and hypercatabolism. However, use of a NRS allows nurses to identify current status, estimate nutritional objectives and plan interventions to prevent the development of malnutrition and associated sequelae (Harrington 2004, Rodriguez 2004). Green and Watson (2005) suggest that, despite the wide number of NRSs, few have been comprehensively validated across a range of patient groups and it is unclear whether such instruments formally assess or screen nutritional status. Concerns also relate to the lack of evidence on the impact on patient outcomes from using an NRS and others pertain to difficulties in establishing clear operational definitions (Lyne & Prowse 1999). These factors may explain the limited use of NRSs in many ICUs.

Nutritional status

The use of a range of measures to assess nutritional status (Table 2) was broadly consistent with previous work with body weight being used either alone or in combination with other measures such as serum albumin (Hill *et al.* 1995, Preiser *et al.* 1999). In this study, a total of 59·7% ($n = 277$) units measured serum albumin as a single criterion or in conjunction with other measures. The high frequency of the use of body weight within nutritional assessment might be because nurses routinely record this as part of the admission process. Anthropometric and functional capacity measures were used rarely.

One disturbing area relates to the lack of standardized practice with regard to the frequency of assessment of patients' nutritional status. For example, in 45·8% of units this was performed weekly, randomly or never. In the majority of units the responsibility for assessment of nutritional status rested with physicians (73·6%, $n = 262$). This means that ICU nurses, who are constantly at the bedside, may fail to develop expertise in recognizing characteristic signs of malnourishment in their patients (Rodriguez 2004). Arguably if nurses participate in reviewing nutritional status of patients daily they can implement appropriate interventions to prevent deterioration. Educating nurses to assess risk and nutritional status improves patient care and may increase the number of critically ill persons eligible for NS (Rodriguez 2004).

Naso/oro-gastric/jejunal tube placement

Consistent with the recommended guidelines, the NGT placement was the main route of administering NS (84·5%, $n = 239$). This figure is higher than that previously reported in many European countries where it has ranged from 34% to 60% (Hill *et al.* 1995, Planas 1995, Preiser *et al.* 1999, Verhage & van Vliet 2002). The wide adoption of nasogastric route as a preferred feeding route for ICU patients, signals a shift in practice which probably results from concerns over the higher risks associated with PN. However, internationally recognized guidelines for enteral feeding state that small bowel feeding is preferable to gastric feeding (Heyland *et al.* 2003b) and this route was used rarely in our study.

Currently abdominal radiographs are regarded as the gold standard for checking the position of a feeding tube (Metheny & Titler 2001, Ellet 2004) although our data suggest that the practice of auscultation and injecting air into the tube was the most common method used (72·6%) to check the placement of the NGT. Radiographs (34·9%), testing for the presence of bile in the aspirate (30·5%) and measuring pH (5·6%) were used less often. Although our study suggests that there has been a fall in the use the auscultation technique (formerly 95%, Preiser *et al.* 1999) the practice is widely prevalent, however, the presence of gurgling sounds following an injection of air can be misleading as hearing these does not confirm that the tube is actually in the stomach (Datt *et al.* 2004). Not surprisingly there have been calls to ban this method of checking tube placement (Metheny & Titler 2001) and it is not supported in the UK by the National Patient Safety Agency (NPSA 2005).

Nasogastric tubes can also be accidentally displaced during nursing manoeuvres or migrate downwards into the small intestine or upwards from the postpyloric intestine back into the stomach. The practice of regularly checking that the tube is either in the stomach or in the postpyloric zone is therefore recommended (Williams & Leslie 2005). This can be costly and labour intensive if radiographical checks are used exclusively. There is also the added risk of repeated exposure to radiation. At present, the NPSA (2005) advocates only two methods: regular pH measurement of the gastric aspirate using pH strips graded in half-points and radiography using fully radio-opaque tubes with measurement markers. This advice is consistent with

current guidelines (Metheny & Titler 2001). Whilst not 100% accurate, Metheny and Stewart's (2002) study demonstrates that the presence of bile in aspirate (indicating it is probably in the small bowel) and the pH of aspirate (≤6 gastric; >6 intestinal) are reliable indicators of accurate position by eliminating non-respiratory placement. Using this combination of tests is currently deemed as best available practice in determining location of NGTs (Ellet 2004). However, if patients are receiving continuous feeding regimes, or there is evidence of aspiration, pH results may be inaccurate.

The analysis of our data also identified that NG tubes were changed on a random basis in most units (Table 3) but in 11·9% ($n = 43$) of ICUs these were never replaced. Reasons for replacing the NGT were not investigated. According to a National French Healthcare Agency, there is no current recommendation to support a specific pattern of changing tubes, regardless of where they are placed (Agence Nationale d'Accréditation et d'Évaluation en Santé 2001). Williams and Leslie's (2004, 2005) comprehensive review did not address this issue, although it is acknowledged that tubes do become blocked, kinked and accidentally dislodged and to some extent this may account for the random pattern of tube-changing found in this survey. Pancorbo-Hidalgo *et al.* (2001) reported that 31·2% of their medical patients needed three or more tubes replaced. Reasons for replacing tubes regularly included blockage caused by crushed tablets and manipulation or removal by patient. These adverse events are not uncommon in ICU and frequent tube change prevents vulnerable patients from receiving their prescribed calorie and protein intake which might prove deleterious in the long-term.

Protocols

The use of evidence-based protocols, as noted earlier, can improve standards of nutrition in the critically ill, leading to an increase in the number of calories and nutrients patients receive, reduce potential risks and influence outcomes of survival (Martin *et al.* 2004, Mackenzie *et al.* 2005). While three quarters of respondents in this study replied that they used clinical protocols or guidelines for enteral feeding, only 21·2% ($n = 55$) were developed by nurses. Northern European countries were more likely to have protocols and there were significant differences according to the different geographical region ($p < 0·001$). The self-reported use of nutritional protocols for critically ill patients may at one level represent a major advancement in practice compared with Preiser *et al.*'s (1999, p. 99) study which was conducted 'in the absence of firmly established recommendations for nutritional care in the critically ill'. However, caution needs to be exercised when interpreting these results, as the questionnaire did not ask for the type of information included in the protocols or whether the content was underpinned by best evidence.

Impact of nutritional support teams

According to our data only 36·1% ($n = 137/370$) of respondents indicated that their ICU was supported by a NST. This figure reflects a small increase from the 29% reported by Preiser *et al.* (1999). In units with a NST, nutritional risk scoring was more likely to be undertaken when compared with those without. There was also a significant difference ($p < 0·001$) in the frequency of nutritional assessments, with nearly half (45%) of units with an NST assessing nutritional status daily. The presence of a dedicated nutritional team may reflect hospital or national policies and as the questionnaire did not offer a definition of the characteristics of a NST, the tasks undertaken by such teams may vary between units and countries.

Nevertheless, progress in establishing NSTs across European ICU has been very slow, possibly due to the lack of available evidence that demonstrates their effectiveness. A study in Germany (Shang *et al.* 2003) concluded that the members of NSTs rarely held the appropriate qualifications, that the consistency in care provided by such teams was non-existent and many of those involved had other heavy clinical commitments and did not operate in an interdisciplinary mode. In addition, most teams were dependant upon third party funds from industry.

To date, the involvement of ICU nurses in NSTs has not been described in the literature. In this study, 73% of such teams were managed either by a physician or a dietician and only 9·7% ($n = 14/144$) were led by nurses (see Fig. 2). This might be due to the specialist nature of NS or because historically nurses have not been legally permitted to prescribe EN. Rodriguez (2004) adds that because nurses are given minimal responsibility within such teams, they do not view their duties to be of high priority. It is also noteworthy that 13·2% ($n = 50$) units described themselves as surgically orientated and 25·8% of all patient admissions from responding ICUs were categorized as surgical. As these patient groups tend to have a short ICU length of stay, between 24–48 hours, it is quite possible that in these situations, nurses may not identify the provision of nutritional requirements as a key-nursing priority. This may account for their low engagement in nutritional care.

Limitations

The fact that a convenience sample was used and that some of the terms used within the questionnaire, for example NRS and NST, were not given operational definitions are limitations which prevent the results of this survey being generalized. Furthermore, while the letter of invitation was addressed to the senior nurse of each ICU, there were no controls for respondent bias and the results may, to some extent, reflect the personal opinions of those completing the questionnaire. Additionally, because the self-administered questionnaire was anonymous, there may have been differences in the responses according to the experience and qualifications of the respondents. Had ICU dieticians and intensivists been included in the survey it is possible that different perspectives would have emerged.

This survey has investigated practices and procedures in ICU only. However, many of these practices and procedures are also commonplace outside the ICU and the findings of this study may have some relevance to other areas in which acute and critically ill patients are cared for.

Conclusion

Overall there are some similarities and differences in nutritional practices and procedures between European adult ICU. In some areas, practice was consistent, for example, in the widespread adoption of NG tubes as the preferred feeding route and in the increased use of nutritional protocols, which are supported by international guidelines (Dhaliwal & Heyland 2004). There are also some key issues which warrant further attention. These relate to the limited involvement of ICU nurses performing nutritional assessments, developing evidence-based clinical protocols on feeding and revising their guidelines for NGT placement. It might be speculated that the underlying problem relates to lack of expertise, resources and time to access the best available evidence to inform practice and increase the confidence of nurses in developing clinical protocols to optimize care. Collaboration in establishing intra-professional European guidelines on EN is one solution to improving standards. Nurse education programmes can play a part too, in supporting clinical practice, by placing a strong emphasis on theoretical concepts, skill development and the use of critical appraisal skills.

Nurses play a key role in the nutritional management of critically ill patients, particularly because they are most usually responsible for ensuring the patient receives their prescribed nutrition. In this survey, physicians were primarily responsible for nutritional assessment. However, following initial assessment, continuous monitoring of nutritional status is required with regular revision according to changes in the patient's status. In this context, continuous assessment of the patient's nutritional status (and their response to treatments and interventions) is a highly relevant element of the ICU nurse's ongoing responsibility. Assessment of a critically ill patient's nutritional status and requirements can be very complex and the role of the dietician is also crucial. As experts in this area, they are a valuable resource to the ICU team and ideally will be involved actively in the care of all patients.

As with many other dimensions of intensive care, nutritional management is a multi-professional responsibility, which requires a co-ordinated team approach. Therefore, safe and effective practice requires the collaborative efforts of all members of the team. As such, we recommend that the development of policies, procedures and clinical-practice guidelines and educational programmes in this area should be inter-professional, where professionals learn with, from and about each other to facilitate collaboration and service improvement (Fulbrook & Cockerell 2005).

Contributions

Study design: PF; data collection and analysis: PF, AB; manuscript preparation: JWA, PF.

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