ORIGINAL RESEARCH

Postpyloric feeding tube placement in critically ill patients:

Extending the scope of practice for Australian dietitians

Running head: Postpyloric feeding tube placement by dietitians

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Abstract

Aim: To determine whether placement of a postpyloric feeding tube (PPFT) can be taught safely and effectively to a critical care dietitian.

Methods: Prospective observational study conducted in an adult intensive care unit (ICU). The intervention consisted of 19 attempts at postpyloric intubation by the dietitian. The 10 'learning' attempts were performed by the dietitian under the direction of an experienced (having completed in excess of 50 successful tube placements) user. A subsequent nine 'consolidation' attempts were performed under the responsibility of the intensive care consultant on duty. The primary outcome measures were success (i.e. tip of the PPFT being visible in or distal to the duodenum on x-ray) and time (minutes) to PPFT placement. Patients were observed for adverse events per standard clinical practice.

Results: 19 postpyloric tube placements were attempted in 18 patients [52 (23 – 70) yrs, ICU admission diagnoses: trauma n=4, respiratory failure n=3, burns, pancreatitis, and renal failure n=2 each]. No adverse events occurred. Most (75%) patients were sedated and mechanically ventilated. Prokinetics were used to assist the tube placement in 11% (2/19) of attempts, both of which were successful. Placement of PPFT was successful in 58% (11/19) of attempts. Whilst training the success rate was 40% (4/10) compared with 78% (7/9) once training was consolidated ($P = 0.17$). In the successful attempts the mean time to placement was 11.0 min (3.9 - 27.1 minutes).

Conclusions: A dietitian can be trained to safely and successfully place PPFT

in critically ill patients.

Key words: critical care, clinical nutrition and dietetics, enteral nutrition, scope of practice.

Introduction

Nutritional support is a key component in the management of patients in the intensive care unit (ICU). Enteral nutrition is preferred to parenteral nutrition and usually in the first instance is provided intragastrically. However it is often not tolerated well in critically ill patients for a variety of pathophysiological reasons and pharmacological influences.¹ The delivery of nutrients into the small intestine is an important strategy in optimising enteral nutrient support to critically ill patients with gastric stasis resistant to prokinetics.² Its efficacy depends on the timely and successful placement of feeding tubes distal to the pylorus.

Multiple techniques are available for the positioning of postpyloric feeding tubes (PPFT) some of these include air insufflation, pH assisted, and spontaneous passage with or without motility agents³ but their large-scale implementation is limited by cost, the requirement for specialised equipment, personnel or training requirements or transfer of patients outside of the ICU.³⁻¹⁰ The use of an electromagnetically-guided placement technique applied at the bedside has been shown to be successful and rapid in positioning PPFT in mechanically-ventilated patients in the ICU.¹¹ Further, it requires minimal

training and once a reliable approach is established it can be taught to clinicians from various disciplines.¹¹

Many ICUs value a multi-disciplinary approach where intensivists, dietitians and nursing staff are involved in the management of nutritional care for patients. The primary interest of the critical care dietitian is the nutritional management of critically ill patients. Thus, training the critical care dietitian in the use of this simple bedside technique for the placement of PPFT's could prove invaluable in a busy ICU where medical officers are often pressed for time with multiple high priority issues. To that end, the delay in insertion of postpyloric feeding tubes in critically ill patients has been reported to be up to 1.5 days.¹² Further there would be personal benefits such as potential advancement to specialist status and professional benefits such as promoting the profession as leaders in the area of nutrition from a theoretical and practical perspective to extending the scope of practice for the critical care dietitian. The aims of this study were to (i) determine whether the critical care dietitian could be trained in the use of an electromagnetically-guided placement technique for insertion of postpyloric feeding tubes into critically ill patients and (ii) evaluate the efficacy and safety of such training.

Methods

This is a prospective observational audit conducted in a tertiary mixed medical-surgical, adult ICU, between 1st December 2008 and 1st December

2010. Approval for the conduct and publication of this study was provided by the Royal Adelaide Hospital Research Ethics Committee.

Postpyloric feeding tubes were placed using an electromagnetically-guided placement technique (Cortrak Enteral Access System, Corpak MedSystems, Wheeling, Ill, USA). Participants were patients who were admitted to the ICU and who had gastric stasis or required a postpyloric feeding tube for research purposes. The patients were recruited as a convenience sample. All patients were fed according to the unit feeding protocol which determines that patients with gastric stasis resistant to prokinetics receive a postpyloric feeding tube. Gastric stasis was defined by at least two gastric residual volumes >250 ml in a 24-hour period and resistant to administration of both erythromycin 200 mg twice daily and metoclopramide 10 mg four times a day. Attempts were classified as learning and consolidation stages of training. The 10 'learning' attempts were performed by the critical care dietitian (RY) under the direction of an experienced user (AD) of the tube placement method and using the technique described previously.¹¹ To develop independence with the technique nine 'consolidation' attempts were performed by the critical care dietitian under the responsibility of the intensive care consultant on duty, who had varying amounts of experience with the technique from nil to experienced user. Postpyloric feeding tube placement was confirmed by abdominal radiography, reviewed by a medical officer blinded to the purpose of the study. Patients were monitored for adverse events by nursing staff as per standard clinical practice

(for example but not exhaustive, haemodynamic variables and respiratory parameters were monitored and documented).

Data were collected on success (as defined by the tip of the feeding tube being visible in or distal to the duodenum on x-ray) of PPFT placement and time (min) from commencement (nasal intubation) to completion of successful PPFT placement. Information regarding patient demographics and injuries were documented. Data on age are presented as mean (range); on success rate and times for placement of PPFT are presented as mean (range). Data on success rate (by learning attempt and mechanical ventilation status) were analysed using Fishers exact test and on time to successful placement using an Independent samples t-test (SPSS version 17.0, SPSS Inc, Chicago, Ill, USA). Descriptive statistics were used for analysis of all the other data. Statistical significance was set at a P value of <0.05 .

Results

The critical care dietitian was naive to this technique prior to commencing the training. Patients were aged 52 (23 – 70) yrs. Patients were admitted to the ICU for reasons including multi trauma (n=4), respiratory failure (n=3), severe burns, severe pancreatitis, renal failure (n=2 each) and miscellaneous (n=5).

Nineteen placements were attempted in 18 patients. There were two attempts at placement in one patient and these occurred on different days. In

this patient re-insertion of the postpyloric feeding tube was required for clinical reasons. No adverse events occurred during placement of tubes. Postpyloric tube placement was successful in 11/19 (58%) of attempts. In these attempts the mean time to placement was 11 min (3.9 - 27.1 min).

Placement distal to the pylorus was more successful during the consolidation phase [78% (7/9)] in comparison to the learning phase [40% (4/10)], although this was not statistically significant ($P=0.17$). There was a weak positive association between increased attempts and the success rate ($r = 0.43$, $p = 0.067$).

Most (75%) patients were sedated and mechanically-ventilated at the time of postpyloric feeding tube intubation. Placement success rate tended to be higher in non-mechanically-ventilated patients 83% compared with mechanically-ventilated patients 46% ($P=0.18$).

A prokinetic agent erythromycin (200 mg intravenous) was used to assist the tube placement in two patients (11%) and tube placement was successful in both, compared with 53% success when no drug therapy was used.

Discussion

This study is the first to describe the success and safety of training of a dietitian to place postpyloric feeding tubes (PPFT) into critically ill patients in an Australian intensive care unit. We have shown that when a standardised electromagnetically-guided technique¹¹ is employed by a single experienced

(having completed in excess of 50 successful tube placements using this technique) user to train a novice technician (i.e. the critical care dietitian) PPFT can be placed into critically ill patients without adverse effect. The success rate of placement under these conditions once 'training' was completed was 78%. This compares favourably with a previous study where dietitians used the same electromagnetic device to place PPFT into a range of hospitalised patients in the USA.¹³ In their study the success rate was set at 70% based on previous literature to justify the use of the system over 'blind' tube placement.

Enteral nutrition is widely-advocated and intragastric delivery is the mainstay of enteral nutrition therapy for critically ill patients.² Gastric feeding can fail in up to 50% of critically ill patients however¹ and if prokinetics are ineffective, PPFT are recommended by most feeding protocols as a last option for delivering nutrition enterally.² A meta-analysis of 15 randomised trials found small bowel feeding was associated with a reduced risk of ICU-acquired pneumonia when compared to gastric feeding.¹¹ This prompts consideration of the routine use of post pyloric feeding in critically ill patients especially for patients at high risk of aspiration. If such recommendations were adopted the placement of post pyloric feeding tubes would become more wide spread, necessitating the need for sufficient staff trained to facilitate this. The placement of PPFT in critically ill patients is challenging on a number of fronts including competing priorities, cost, time delays and the requirement for specialised equipment and training.^{3,5-10,14} Our group has previously described a technique

that enables successful, rapid bedside placement of PPFT which can be taught easily to a number of different clinicians.¹¹ We have shown here that after only 10 'learning' attempts the success rate increases dramatically from 40 to 78% suggesting a steady and rapid improvement when a novice user is taught this technique.

Australian critical care dietitians are not routinely involved in the placement of PPFT into critically ill patients. They are however uniquely placed to undertake this procedure. They are at the forefront of the day to day nutritional management of critically ill patients; their priority is the optimisation of artificial nutrition support for critically-ill patients and they are uninterrupted by the non-dietetic issues encountered by ICU medical officers and nursing staff. No formal structure exists in Australia to support the skill acquisition and consolidation required for dietitians to undertake this procedure. This is potentially due to a lack of interest, confidence to undertake a new skill and / or perceived need. Because insertion of enteric feeding tubes is outside the scope of Australian dietitian practice there is potentially the lack of opportunity and /or exposure to cases required for training and proficiency-building. When a skill is not within the usual scope of practice for a dietitian limiting the number of dietitians that perform that skill may be a way of maintaining a steady learning curve; this strategy may prove useful for Australian dietitians wishing to learn and improve proficiency in a new technique. A North American study showed that when PPFT placement was performed either by a dedicated nutrition

support dietitian or clinical nurse specialist working in the ICU the success rate was over 85%.¹⁵ Further over 95% success rate was noted when 135 PPFT were placed into critically ill patients by a single dedicated nutrition support dietitian.¹³ With an appropriate training, credentialing and accreditation structure in place this practice could be adopted successfully by Australian critical care dietitians.

Our success rate on this study was slightly less than that described by other investigators in which a non-medical clinician (i.e. a dietitian or a nurse) has placed PPFT using similar electromagnetically-guided bedside placement techniques.^{13,14,16-18} There are a number of likely reasons for this. For pragmatic reasons, we capped the attempt duration at 30 minutes; whilst many other studies had higher success rates, their mean time to placement was 30-60 minutes. Secondly, our attempt number was much smaller suggesting, not surprisingly proficiency increased with increased attempts. We have shown a trend for a potential positive relationship between attempt number and success rate. Thirdly, most other practitioners were not 'novice' to the technique they used. Our study describes training of the technique to a novice clinician rather than success for a clinician who performs this as part of their core responsibilities (as is the case for nutrition support dietitians).¹⁹ Finally most other studies used prokinetic administration as part of their PPFT placement protocol. In a small number of patients (n=2) who received a prokinetic in this study we achieved 100% success rate in placing PPFT. The results of a recent

meta-analysis²⁰ demonstrate that prokinetic agents compared with no prokinetic agent use are associated with a higher success rate for PPFT placement in adult subjects. Based on this it may be prudent to consider the routine use of prokinetic agents when employing bedside methods for placing PPFT.

A discussion on the extended scope of practice (ESP) for Australian dietitians is warranted. Elsewhere internationally dietitians routinely place enteral feeding tubes and have within their professional standards a process that enables the development of ESP roles.^{3,13,18,21} In their recent work Ryan *et al.*²² cite a distinct scarcity in evidence relating to local dietetic experience around ESP roles and subsequently propose a comprehensive model that integrates work systems, processes and outcomes around ESP for dietitians.²² Despite or perhaps because of this lack of evidence there is increasing acknowledgement by the Australian dietetic community that undertaking ESP work and developing ESP roles is important to the growth of the local dietetic profession and individual practitioners. In her editorial on dietitians as leaders Capra²³ suggests that protecting the scope of practice for dietitians in the face of the modernisation of and technical advances within the health care system may prove challenging. However, she also cites the exciting opportunity that presents itself if dietitians themselves maintain an internal vision and leadership to move forward the pursuit of ESP and promote the benefits of specialist status within the profession. To that end the Dietitians' Association of Australia has recently published a document that supports dietitians in such endeavours.²⁴ A

recent systematic review on the same topic demonstrates a broader appeal than just within the dietetics profession that ESP for allied health professionals confers a cost-effective and consumer-accepted investment that could be utilised by health services to improve patient outcomes.²⁵

In our cohort, no patient had an injury that influenced the successful placement of the PPFT. While it would be inappropriate for us to comment on whether this technique is considered safe to conduct in all critically ill patients as this query is outside the scope of this study it is worth noting that in some patient groups (e.g. those with facial trauma) the placement of a PPFT (or any feeding tube) may be inappropriate or impossible. Clinical judgement should prevail in assessing the appropriateness of a patient for the application of this technique.

In conclusion, we have shown that a critical care dietitian can be trained to place PPFT safely and successfully in patients in the ICU. Relatively little training is required. This is to our knowledge the first time to have been demonstrated in an Australasian ICU. Wider-scale adoption of this technique may facilitate earlier optimisation of enteral feeding in critically ill patients. Further it will align more closely the Australasian dietitian skill mix with that of our international counter-parts.

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Conflicts of Interest

There authors have no conflicts of interest to declare.

Authorship

Yandell R contributed to the conception and design of the study, acquisition of data, analysis and interpretation of data, drafting the article and revising it critically for important intellectual content, and final approval of the version to be submitted. Chapman M contributed to the conception and design of the study, acquisition of data, analysis and interpretation of data, drafting the article and revising it critically for important intellectual content, final approval of the version to be submitted. O'Connor S contributed to the conception and design of the study, and acquisition of data, analysis and interpretation of data, drafting the article and revising it critically for important intellectual content and final approval of the version to be submitted. Shanks A contributed to the design of the study and drafting the article and revising it critically for important intellectual content and final approval of the version to be submitted. Lange K contributed to the design of the study, analysis and interpretation of data and drafting the article and revising it critically for important intellectual content and final approval of the version to be submitted. Deane A contributed to the conception and design of the study, acquisition of data, analysis and interpretation of data, drafting the article and revising it critically for important intellectual content, and final approval of the version to be submitted.

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