Evaluation of Implementation of Fasting Guidelines for Enterally Fed Critical Care Patients

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Abstract

Background and aims: Critically ill adults have increased nutrition risk. Prior to procedures patients are often fasted, leading to nutritional deficits. The use of fasting guidelines may therefore help reduce deficits from accumulating. The aim of this work was to determine the impact on nutrition support delivery following the implementation of fasting guidelines in addition to characterizing staff knowledge of the guidelines.

Design: Retrospective data were collected on n=74 patients at two different time points; prior to launch of fasting guidelines and post launch, with regards to estimated nutritional requirements, nutritional targets, volume of enteral nutrition (EN) delivered and periods of fasting. Clinical variables of interest were collected for up to 14 days. Questionnaires assessing staff knowledge/barriers to usage of the fasting guidelines were administered to ICU staff.

Setting: 3 ICUs (General, Cardiac and Neurosciences) within University Hospital Southampton NHS Foundation Trust.

Patients: Mechanically ventilated adults in an ICU and receiving exclusive EN.

Measurements and main results: Comparison was made between pre- and post-guideline implementation with statistically significant improvements in the % EN delivered (76.4±11.8 vs. 84.1±10.8 (p=0.009)) and duration of feeds withheld (41.5± 26.6 vs. 27.6±20.8 hours (p=0.02)). There were non-significant improvements pre- and post-implementation in the % of energy and protein delivered (80.7±16.4 vs. 86.5±17.3 (p=0.15 (NS)); 74±18.3 vs. 79±18.5 (p=0.15 (NS)))

77% of staff were familiar with the guidelines, whilst 42% requested further education. The main barriers to compliance were delays and unpredictable timing of procedures, and differing guidance from senior staff and non-ICU teams.

Conclusions: Implementation of fasting guidelines led to significant improvements in EN delivery and reduced duration of feed breaks. The use of fasting guidelines is a positive step towards increasing nutrition delivery in the ICU. Further staff education and better planning around procedures is

required to promote further adherence to the fasting guidelines.

Introduction

Mechanically ventilated adults are unable to take sufficient nutrients orally and as such require enteral nutrition (EN) via a nasogastric tube in order to meet nutritional requirements (1). Many studies have reported a high incidence of unintentional underfeeding (2). Positive associations have been reported with increased calorie and protein intake in several large scale observational studies (3,4,5,6,7). Delivery of adequate nutrition support aims to minimise the loss of lean body mass associated with the catabolic stress response seen in critically ill patients and therefore may reduce complications, reduce length of stay and improve patient outcomes (1).

The most common reasons for interruptions of EN are; fasting for diagnostic and airway procedures, feeding intolerance and lack of enteral feeding access. Frequent interruptions lead to inadequate volumes of EN being delivered and large nutritional deficits accumulating during the intensive care admission (8).

Historically, fasting prior to procedures has been advocated to minimise the risk of pulmonary aspiration of stomach contents on induction of anaesthesia (9). Guidance for fasting prior to surgical procedures (10,11,12) is intended for healthy individuals undergoing elective surgery but such guidance if also often applied to ICU patients. However the need for lengthy fasting times in mechanically ventilated patients has been challenged as many have cuffed tracheal tubes negating the need for such precautionary measures (13,14,15). Work from the “PEPuP” group has shown that a reduction in fasting times prior to surgery and ICU procedures results in improvements in nutrition delivery with no increase in complication rates (16).

The aim of this service improvement project and audit was threefold: to investigate i) the impact of implementation of fasting guidelines on EN delivery; ii) compliance with the local fasting guidelines; iii) staff knowledge of the guidelines and barriers to their implementation.

Methods

Using the electronic record system (MetaVision) retrospective data were collected for n=74 patients who were consecutively commenced on EN following admission to the general, cardiac or neuro intensive care units (which will be referred to as ICUs) at two different time points: prior to launch of fasting guidelines and post-launch of the guidelines. The fasting guidelines were based on the "Guidelines for Enteral Feeds and Surgical Procedures" produced as part of the PEPuP Protocol (17). An ICU stakeholder group including consultant anaesthetists, pharmacists, dietitians, nursing staff and physiotherapists iteratively developed adapted fasting guidelines based on the PEPuP protocol over a 3 month period. The final guidelines included specific practice points around tracheal intubated patients: i) EN should be continued until the start of the procedure or transfer to the operating theatre for non-airway related procedures, ii) prior to the procedure the feeding tube should be aspirated emptying the stomach contents, iii) if manipulation of the airway is required, EN should be withheld for 6 hours prior to the procedure.

During the implementation period of the fasting guidelines 18 education sessions were provided by the unit dietitians and practice development nurses to all critical care staff. The education sessions took the form of taught sessions at nursing and medical team meetings. In addition posters were displayed throughout the critical care units and e-mail communication regarding the change in practice was sent to all ICU staff and anaesthetists.

Clinical information of interest was collected with respect to demographics, clinical variables and nutrition information such as; estimated nutritional requirements, prescribed nutritional targets, enteral feed volume , and reasons for and duration of feed breaks during the two month data collection period at each time point. All adult patients commenced on EN on the ICU were included. Patients were excluded if they received <4 days EN or if they received other sources of nutrition (oral or parenteral) during the data collection period. Clinical data were obtained from medical notes, observation charts and fluid balance charts for the duration of EN up to a maximum of 14 days. The questionnaire consisted of six yes or no questions relating to knowledge of the ICU fasting guidelines and a further eight questions on potential barriers to following the guidelines.

Respondents were asked to score each of these eight statements as to how much they felt these posed a barrier to following the guidelines. Questionnaires were piloted with 5 ICU nurses prior to administration and amendments made following their comments. Questionnaires (see supplementary material) were administered by one investigator (BJ) to all ICU medical staff on duty on the day shift, and to nurses at the bedside, during a 1 week period in March 2017 with the aim of assessing knowledge of the fasting guidelines and barriers to use. Participants were then asked open ended questions with regards to potential barriers that would prevent the guidelines being followed.

SPSS version 20 (Chicago, IL) was used for statistical analysis. As data were normally distributed parametric tests were used; these included Chi square tests and correlations to investigate relationships between clinical variables of interest. Statistical significance was set at $p < 0.05$. Unless specified otherwise, values are shown as mean and standard deviation.

Qualitative data from within the free text comments from the questionnaire were transcribed and explored to identify themes and categories that emerged from the data.

The need for ethical approval was waived by a local ethics committee. The study was registered as a service improvement project (number 5358) via the Trust Clinical Effectiveness Department. Verbal consent was obtained from all staff participating in the anonymous attitude questionnaire.

Results

Patient characteristics

74 ICU patients were included in the analysis; 32 in the pre-guideline group and 42 in the post-guideline group (Table 1). Nutritional requirements were estimated by ICU dietitians using predictive equations as appropriate to the clinical condition of the patient (18,19,20). All patients were mechanically ventilated on initiation of EN and were enterally pump fed via nasogastric feeding tube with a polymeric 1 kcal/ml enteral feed. Enteral nutrition targets were set by the ICU feeding protocol or by an ICU dietitian.

Table 1. Baseline characteristics of the patients studied

	Pre-guidelines (n = 32)	Post-guidelines (n = 42)	p value
Age (years)	62.0 ± 17.3 (18-85)	59.7 ± 15.8 (21-83)	0.83
Sex (% male)	50	67	0.12
Weight (kg)	76.51 ± 14.75 (52-114)	81.44 ± 16.33 (53-125)	0.69
BMI (kg/m^2)	26.7 ± 4.5 (18.1-34.3)	28.3 ± 6.1 (18.4-44.3)	0.83
Number of days enterally fed	11.6 ± 3.2 (4-14)	9.9 ± 3.9 (4-14)	0.71

Data are presented as mean ± SD (range)

Enteral nutrition received

Prior to implementation of fasting guidelines patients received 76.4 ± 11.8 % of prescribed EN, compared with 84.1 ± 10.8 % post guideline implementation (p= 0.0009). Although not significant, there were improvements pre and post guideline implementation in the percentage of energy and protein delivered with patients receiving 80.7 ± 16.4 % of calorie requirements prior to the guidelines compared to 86.5 ± 17.3 % post guidelines (p=0.15 (NS)); and 73.9± 18.3 % of protein requirements versus 79.1± 18.5 % pre and post guidelines respectively (p=0.15 (NS)).

Reduced fasting time and enteral nutrition interruptions

There was a statistically significant reduction in the number of hours patients were fasted post guideline implementation. Pre guidelines, EN was stopped for a mean of 41.52 ± 26.59 hours per patient (16% of total feed time) compared with 27.63 ± 20.77 hours (12% feed time) post guidelines (p=0.02).

Reasons for withholding enteral nutrition

Pre-guideline implementation the most common reasons for stopping EN were planned procedures and theatre, followed by airway procedures. Post guideline implementation, feeds were withheld on a total of 159 occasions. The primary reason for withholding feeds post guideline was for airway procedures (extubation, intubation or tracheostomy insertion). Planned procedures (theatre, diagnostic procedures and ICU procedures such as line insertions, intra-aortic balloon pump insertion/removal) accounted for a total of 69% (110/159) of all reasons for stopping feed; 14% (22/159) of breaks were due to lack of enteral access and 5% (8/159) due to poor gastrointestinal tolerance (Figure 1).

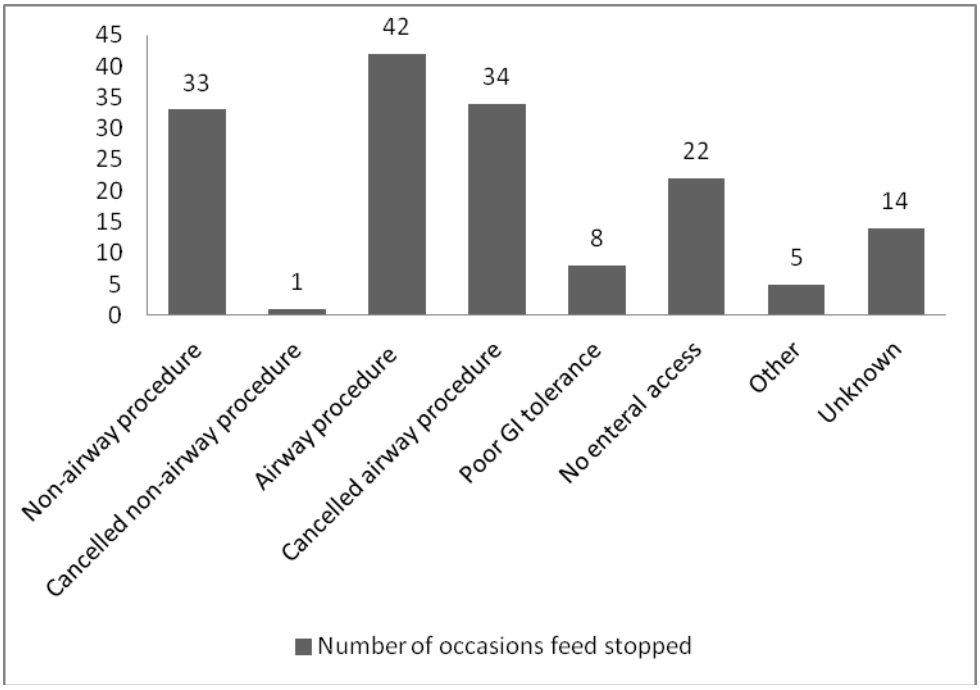

Figure 1: Reasons for withholding EN post guideline implementation

Compliance with fasting guidelines

Fasting guidelines were followed on 46% (53/110) of occasions. There was 57% (43/75) non-compliance with fasting guidelines for airway procedures and 47% (16/35) non-compliance for non-airway procedures (Figure 2).

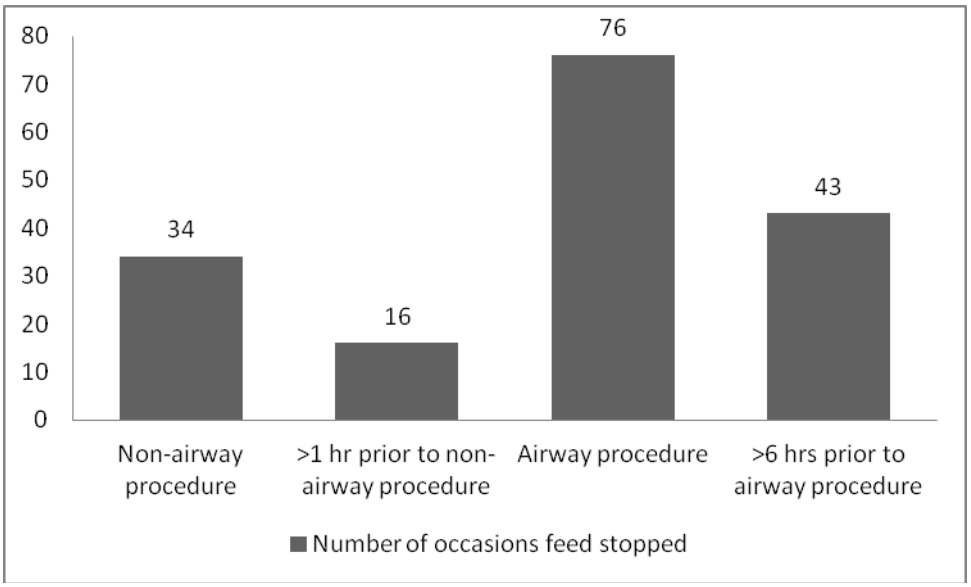

Figure 2: Compliance with fasting guidelines

Staff knowledge of fasting guidelines

Questionnaires were provided to 95 staff on duty during a one week period. 62 staff (65%) completed the questionnaire. The majority of staff reported that they were familiar with the guidelines (77%, n=48) and understood the rationale for guideline implementation (82%, n=51). However, 42% (n=26) of staff stated that they had not received sufficient education on the guidelines (Figure 3).

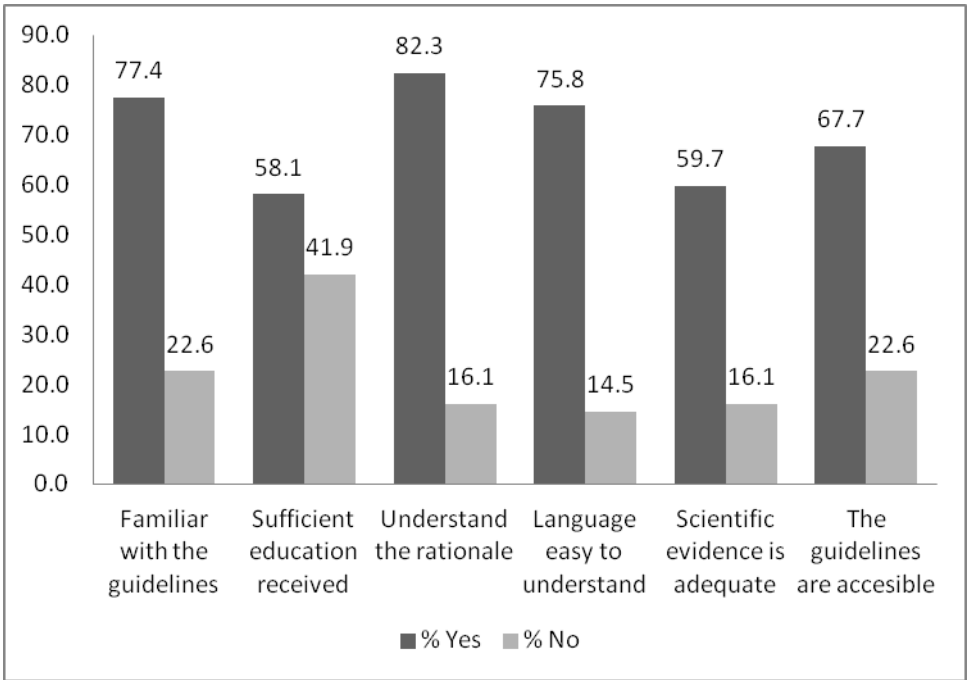

Figure 3: Staff knowledge of fasting guidelines

Barriers to guideline implementation

Although the majority of staff reported they agreed with the recommendations in the guidelines, differing guidance from senior staff and non-ICU medical teams were perceived to be barriers to following the guidelines (Table 2). 56% (n=35) of staff reported that planned procedures are often delayed; this combined with difficulty predicting timing of procedures leads to non-compliance with the guidelines.

	Percentage			
	Always	**Often**	**Occasionally**	**Never**
I disagree with the recommendations	5.9	3.9	37.3	52.9
My superiors give me different recommendations	2.0	21.6	62.7	13.7
Non-ICU physicians give different recommendations	5.9	41.2	33.3	19.6
I am concerned about adverse events	9.8	11.8	35.3	43.1
Clinical condition prevents me from following the guidelines	0.0	13.7	60.8	25.5

I cannot predict when procedures will occur	2.0	34.0	54.0	10.0
Procedures are often delayed	7.7	55.8	34.6	1.9
I do not believe adequate nutrition is important	0.0	6.0	10.0	84.0

174

175 **Table 2:** Barriers to implementation of fasting guidelines (n=51)

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177 Respondents were asked to select which three barriers they felt were most important in
178 preventing the fasting guidelines being followed. 71% (n=44) of respondents identified delays in
179 procedures; 42% (n=26) selected difficulty in predicting when procedures will occur; while 61%
180 (n=38) of participants stated either superiors or non-ICU medical staff requested longer fasts than
181 those recommended in the guidelines.

182 34 respondents entered comments into the free text areas of the questionnaire. Four initial
183 themes were identified. A coding hierarchy was then used to further refine these to 2 key themes:
184 lack of education on the fasting guidelines and barriers from medical / surgical teams. Comments
185 relating to lack of education included:

186 • "Not aware of guidelines as I'm new"

187 • "I was aware there was training but I was not working"

188

189 These comments highlight that although training was provided when the guidelines were
190 launched, many staff were missed and education is required for new staff joining the units.

191 Comments relating to barriers from medical and surgical teams included:

192

193 • "Doctors unaware of guidelines - usually resolved with explanation from nurse" – Senior
194 nurse, Cardiac ICU

- "Mainly the surgeons request to have the feed off 6 hours before theatre, also the junior doctors need training as they always say longer" – Nurse, General ICU
- "I prefer to be guided by clinical experience rather than a guideline" – Doctor, Cardiac ICU

These comments highlight a need for improved education on fasting practices for medical and surgical staff and increased dissemination of the guidelines.

Discussion

The introduction of guidelines for fasting of enterally fed critically ill patients prior to surgical, diagnostic and ICU procedures resulted in a significant reduction in the duration that EN was withheld, with a resultant increase in the volume of feed delivered. Although not statistically significant, there was a trend towards increased delivery of protein and energy. Thus the use of fasting guidelines is a positive step towards increasing nutrition delivery in the ICU. This is in line with the results from the PEPuP study which, although not designed to test the implementation of fasting guidelines, did show an increase in nutrition delivery with reduced duration of peri-procedural fasting (16).

However compliance with the guidelines was variable and fasting guidelines were only followed on 46% of occasions with 57% non-compliance for airway procedures and 47% non-compliance for non-airway procedures. Staff questionnaires identified difficulties with predicting when procedures will occur and delays in timing of procedures. This is likely to account for much of the non-compliance with fasting for airway procedures with nursing staff being required to estimate when an extubation or tracheostomy insertion would occur, in order to turn the feed off 6 hours prior to the procedure. The unpredictable nature of critical illness, combined with the busy workload of ICU medical teams result in procedures often being delayed or re-scheduled. In 45% of occasions where feed was stopped in preparation for an airway procedure, the procedure was subsequently cancelled and rescheduled. This led to multiple fasting episodes for many patients, highlighting the

importance of minimising peri-procedural fasting times to allow adequate EN to be delivered (13,21).

Analysis of the staff questionnaires shows that the majority of staff are familiar with the guidelines, although additional education is required. The questionnaires show that staff who are new to the ICU are unfamiliar with the fasting guidelines and, as such, steps should be taken to include information on cessation of nutrition prior to procedures within new starter inductions. A rolling education programme and inclusion of information on fasting in established ICU nutrition education sessions should be considered to reinforce previous teaching and ensure all staff are aware of the guidelines (13,21). Dissemination of the guidelines outside of the ICU to visiting surgical teams is also important to reduce inconsistent messages.

Despite a recommended fast time of six hours, the results show several patients undergoing airway procedures following a fast of between 2 and 5 hours. No adverse events were noted following this reduced duration of fasting, raising the question of whether it would in fact be safe to reduce fasting times further in this patient group. Segaran et al. (13) successfully implemented a reduced fast protocol for critically ill patients stipulating a fast of 4 hours prior to airway procedures with no adverse events noted in their patient group. However patient numbers in that study were small. Other work investigated the safety of reduced fasting in ICU patients undergoing tracheostomy insertion and showed a reduction in peri-procedural fasting to be safe in these small scale trials. Hartl et al. (14) collected data on 160 patients with no fast prior to tracheostomy insertion and compared this with a control group who received a standard fast; in the study by Gonik et al. (15) 24 patients were fasted for 45 minutes prior to the procedure. No complications or adverse events were noted in either study, highlighting the need to review current fasting practices on the ICU. Both studies concluded that further large scale studies are required to confirm the safety of this practice.

There are some limitations to this work. Due to the retrospective nature of the data collection and incomplete documentation, we were unable to identify reasons for cessation of EN in

9% (14/159) of cases. We are therefore unable to assess whether or not guidelines were adhered to in these instances. Inaccurate documentation could have led to further errors if the times of feed breaks and EN volumes delivered were not recorded accurately on patients' charts. The small numbers of patients included meant that this work was underpowered for some outcomes; future work will include an adequately powered study to determine differences in all the outcomes of interest. The number of respondents to the questionnaire represents only approximately 20% of all ICU staff in the Trust. This is because questionnaires were only provided to staff on duty during a one week period. This low rate of staff inclusion could be a potential source of bias within the questionnaire results.

Further education is required on our units to support fasting guideline implementation. Since data collection was completed for this project, additional changes have been made to the unit's feeding protocols with the use of volume based feeding to further enhance nutritional delivery. Additional audits are planned to evaluate the impact of the combination of reduced fasting guidelines and volume based feeding on delivery of nutritional targets.

Conclusions

Implementation of fasting guidelines resulted in significant improvements in the amount of EN delivered and reduced duration of feed breaks. This was seen despite incomplete adherence to the guidelines. An increase in compliance with the fasting guidelines through increased staff education and improved planning of timing of procedures would be likely to result in a further increase in nutrition delivery which may lead to an improvement in patient outcomes.

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Contributors statement

BJ conceived the project. BJ completed the data collection and analysis under supervision of PCC and LVM. LVM completed the statistical analysis. BJ drafted the manuscript. LVM and PCC edited, read and approved the final manuscript.

Conflict of interests

None

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