Evaluation of implementation of fasting guidelines for enterally fed critical care patients

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SUMMARY

Background & 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 = 0.0009)) and duration of feeds withheld (41.5 ± 26.6 vs. 27.6 ± 20.8 h (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 guideline 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.

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1. 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 [3–7]. 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...
Historically, fasting prior to procedures has been advocated to minimize the risk of pulmonary aspiration of stomach contents on induction of anaesthesia [9]. Guidance for fasting prior to surgical procedures [10–12] is intended for healthy individuals undergoing elective surgery but such guidance is 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 [13–15]. 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.

2. 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 the launch of the 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 h 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. Patient (16% of total feed time) compared with 27.63 ± 17.3% post guidelines (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)).

3.3. 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 h per patient (16% of total feed time) compared with 27.63 ± 20.77 h (12% feed time) post guidelines (p = 0.02).

3.4. 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).

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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 (Fig. 1).

3.5. 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 (Fig. 2).

3.6. 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 (Fig. 3).

3.7. 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.

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

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

- “Not aware of guidelines as I’m new”
- “I was aware there was training but I was not working”

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

Comments relating to barriers from medical and surgical teams included:

Table 1

<table>
<thead>
<tr>
<th>Baseline characteristics of the patients studied.</th>
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<tbody>
<tr>
<td>Pre-guidelines (n = 32)</td>
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<tr>
<td>Age (years) 62.0 ± 17.3 (18–85)</td>
</tr>
<tr>
<td>Sex (% male) 50</td>
</tr>
<tr>
<td>Weight (kg) 76.51 ± 14.75 (52–114)</td>
</tr>
<tr>
<td>BMI (kg/m²) 26.7 ± 4.5 (18.1–34.3)</td>
</tr>
<tr>
<td>Number of days enterally fed 11.6 ± 3.2 [4–14]</td>
</tr>
</tbody>
</table>

Data are presented as mean ± SD (range).

Fig. 1. Reasons for withholding EN post guideline implementation.
Fig. 2. Compliance with fasting guidelines.

Fig. 3. Staff knowledge of fasting guidelines.

### Table 2
Barriers to implementation of fasting guidelines (n = 51).

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Always</td>
</tr>
<tr>
<td>I disagree with the recommendations</td>
<td>5.9</td>
</tr>
<tr>
<td>My superiors give me different recommendations</td>
<td>2.0</td>
</tr>
<tr>
<td>Non-ICU physicians give different recommendations</td>
<td>5.9</td>
</tr>
<tr>
<td>I am concerned about adverse events</td>
<td>9.8</td>
</tr>
<tr>
<td>Clinical condition prevents me from following the guidelines</td>
<td>0.0</td>
</tr>
<tr>
<td>I cannot predict when procedures will occur</td>
<td>2.0</td>
</tr>
<tr>
<td>Procedures are often delayed</td>
<td>7.7</td>
</tr>
<tr>
<td>I do not believe adequate nutrition is important</td>
<td>0.0</td>
</tr>
</tbody>
</table>
• “Doctors unaware of guidelines - usually resolved with explanation from nurse” – Senior nurse, Cardiac ICU
• “Mainly the surgeons request to have the feed off 6 h 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.

4. 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 h 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 6 h, the results show several patients undergoing airway procedures following a fast of between 2 and 5 h. 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. [15] successfully implemented a reduced fast protocol for critically ill patients stipulating a fast of 4 h 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. Hart 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 min 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.

5. 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.

Conflict of interest

None.

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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.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.clnu.2018.01.024.

References


