



Nurses' decision-making around gastric residual volume measurement in UK adult intensive care: A four-centre survey

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Abstract

Background: Despite increasing evidence of the potential inaccuracy and unwarranted practice of regular GRV measurement in critically in adults, this practice persists within the United Kingdom.

Aim: To explore adult intensive care nurses' decision-making around the practice of GRV measurement to guide enteral feeding.

Methods: A cross-sectional 16 item electronic survey in four adult intensive care units (ICUs) in England and Wales.

Results: Two hundred and seventy-three responses were obtained across four ICUs with acceptable response rates for most [Unit 1 74 /127 = 58.2%; Unit 2 87/129 = 67.4%; Unit 3 77/120 = 64.1%; Unit 4 35/168 = 20.8%]. Most (243/273 (89%) reported measuring GRV 4–6 hourly, with most (223/273 82%) reporting that the main reason was to assess feed tolerance or intolerance and 37/273 (13.5%) saying their unit protocol required it. In terms of factors affecting decision-making, volume obtained was the most important factor, followed by the condition of the patient, with aspirate colour and appearance less important. When asked how they would feel about not measuring GRV routinely, the majority (78.2%) of nurses felt worried (140/273 = 51.2%) or very worried (74/273 = 27%).

Conclusions: Factors affecting the nurses' decision-making around GRV were based largely on fear of risk (around vomiting and pulmonary aspiration) and compliance with unit protocols.

Relevance to Clinical Practice: Despite increasing evidence suggesting it is unnecessary, nurses' beliefs around the value of this practice persist and it continues to be embedded into unit protocols around feeding.

KEYWORDS

enteral nutrition, feeding, gastric aspirates, nurse

1 | INTRODUCTION

Enteral nutrition is the preferential method of delivering nutrition in critically ill adults¹ however, there are often challenges to achieving optimal volumes.² In addition to patient-related factors, historical clinical care practices contribute to this problem of inadequate delivery. One such practice is the regular measurement of gastric residual volume (GRV) to guide the initiation, advancement and withholding of enteral feeds.^{3,4} Despite a multicentre randomized controlled trial (RCT) published in 2013⁵ followed by a series of single-site studies^{6,7} and systematic reviews in adults^{8,9} showing that this practice persists in routine practice in UK adult intensive care units (ICUs).⁴ Therefore, we sought to explore ICU nurses' decision-making around this practice in four adult ICUs in the England and Wales.

2 | METHODS

A cross-sectional electronic survey was undertaken across four different general adult ICUs in England and Wales. This study is reported in line with the EQUATOR Network's CHERRIES checklist for E-surveys.¹⁰ Appropriate hospital approvals were obtained and the study was registered as service evaluations in each of the four hospitals. National Health Service (NHS) ethical approval was not required for this staff study and no identifiable data was collected on participating nurses.

2.1 | Instrument development

The 16-item questionnaire was adapted from a previously used and published questionnaire by Tume et al in paediatric intensive care nurses.¹¹ Minor modifications were made to ensure adult-specificity and the study was content checked by four experts and piloted with four different staff to establish face validity [Electronic Supplementary File 1]. The survey data were collected in Microsoft Forms account of Edge Hill University and distributed via email link (a QR code was also generated to aid distribution and facilitate high response rates). Lead staff at each site distributed the questionnaire link via email and QR to clinical nursing staff of all grades on their units. Regular feedback on response rates and repeated reminders were used to maximize response rates at each site with the aim to achieve >60% response rate per site. The response rate was calculated by the number of staff responding per unit/the number of staff that questionnaires were sent to in each unit.

Data was collected between June and September 2023. Our inclusion criteria were clinical nurses or assistant practitioners who are working in ICU and make decisions around feeding. We excluded non-clinical nurses, nurses not working in bedside nursing roles, and bank or agency staff.

What is known about the topic

- The evidence to support the practice of routine gastric residual volume measurement to guide enteral feeding is poor.
- Despite this, UK adult ICU practice surveys have shown this practice to be prevalent.

What this paper adds

- This study shows nurses decision-making around measuring gastric residual volume is based on perceived fears and risks of having a full stomach and inaccurate assumptions about the accuracy and reliability of this measurement.
- A future UK-wide active de-implementation study is required to de-adopt this low-value nursing practice.

2.2 | Settings and sites

ICU 1 In Northwest England is a large 26-bed general ICU and trauma centre in a university-affiliated centre, admitting around 1200 patients a year.

ICU 2 In Northwest England is a 28-bed district general hospital that admits around 1700 general medical-surgical patients a year.

ICU 3 In Northwest England is a 33-bed large urban teaching hospital in a university-affiliated centre, admitting general medical, surgical and oncology patients, admitting around 1885 patients a year.

ICU 4 in Wales is a 24-bed district general hospital that admits around 1200 general medical-surgical patients a year.

All sites had written feeding protocols around enteral feeding, which required regular GRV measurement between 4 and 6 hourly. All ICUs had a dietician as part of their team.

2.3 | Data analysis

Quantitative data were analysed descriptively in Microsoft Excel, in terms of percentages and categories as per the aim of the study. Free text responses were analysed by simple thematic analysis, by three members of the team independently (VW, AL, NT), then responses were compared and any differences resolved by discussion and a third expert team member (LT). This followed the Braun and Clarke principles (2012).¹²

3 | RESULTS

Two hundred and seventy-three (273) responses were obtained across four ICUs with acceptable response rates for three of the four

units [ICU 1 74 /127 = 58.2%; ICU 2 87/129 = 67.4%; ICU 3 77/120 = 64.1%; ICU 4 35/168 = 20.8%]. Most 94/273 (34.4%) respondents were staff nurses without a specialist ICU qualification (Table 1) and 107/273 (39.1%) had ≥ 10 years' ICU experience.

Most (243/273 (89%) reported measuring GRV 4–6 hourly, with most (223/273 82%) reporting the main reason was to assess feed tolerance or intolerance, with 13.5% (37/273) saying their ICU protocol required it (Figure 1). When asked about factors that impacted the nurse's decision to replace or discard the aspirate, the volume obtained was the most important factor, followed by the condition of the patient, with aspirate colour and appearance less important (Figure 2). Nurses perceived their role around starting, delivering and assessing the response to enteral feeding to be very important.

When asked how they would feel about not measuring GRV routinely, the majority (78.2%) of nurses felt worried (140/273 = 51.2%) or very worried (74/273 = 27%). However, when asked how they

would feel if this was performed as part of a large, randomized trial, most (192/273 70.3%) said they would feel fine with this, with some 26.3% (72/273) still feeling somewhat concerned.

3.1 | Qualitative results

There were five free-text questions that were analysed qualitatively. The themes identified are ranked in order of the number of responses relating to this theme. All 273 nurses provided free-text comments for analysis of all questions.

The most common perceived harm from a high GRV was **the risk of vomiting with subsequent pulmonary aspiration**:

“There is the potential to vomit and aspirate” [Staff nurse].

This was followed by **the risk of malabsorption of feeds and medicines with impact on nutrition, blood glucose, and electrolytes**

“We need to know if a patient is not absorbing feed or needs gastric drainage”

[Staff nurse]

Patient discomfort, such as pain, abdominal distension was also cited as a concern for nurses.

“Having a high GRV may cause patient discomfort and pain”. [Senior nurse]

Finally, nurses also expressed concerns that a high GRV may reflect **gut issues, such as paralytic ileus, ischemia and/or obstruction**.

TABLE 1 Survey respondents.

Nurse grade	Number (%)
Associate nurse	4 (1%)
Staff nurse without specialist ICU course	94 (34.4%)
Staff nurse WITH specialist ICU course	54 (19.7%)
Senior nurse	85 (31%)
Clinical nurse manager	36 (13%)
Years of ICU experience	
<12 months	30 (10.9%)
1–5 years	88 (32.2%)
5–10 years	48 (17.5%)
>10 years	107 (39.1%)

Note: Staff nurse is UK Band 5; Senior nurse = UK Band 6 and Clinical nurse manager = UK Band 7.

Abbreviation: ICU, intensive care unit.

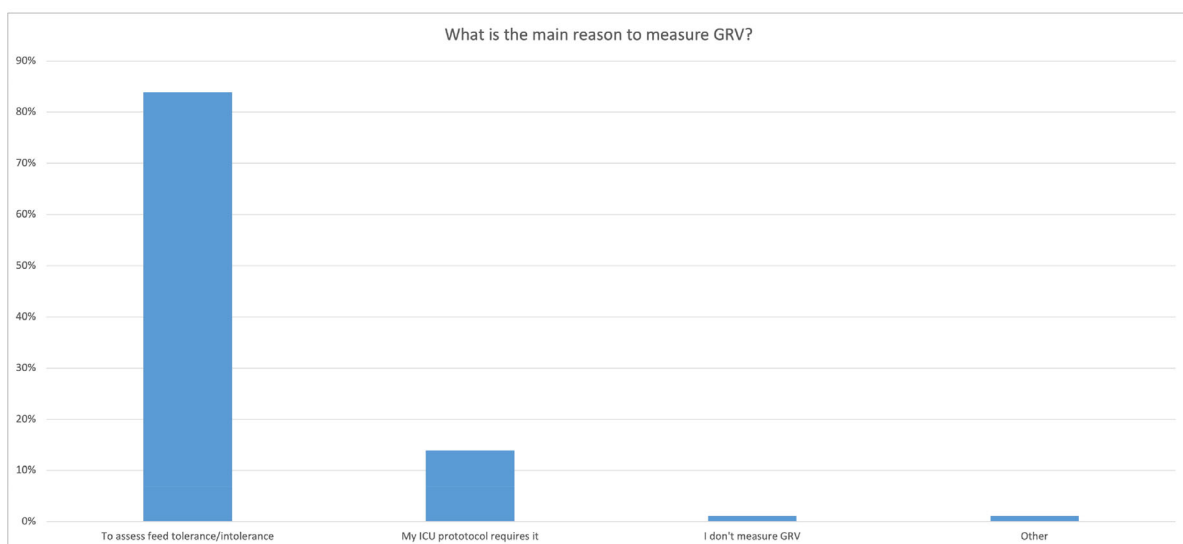


FIGURE 1 Main reasons nurses cited for measuring gastric residual volume (GRV).

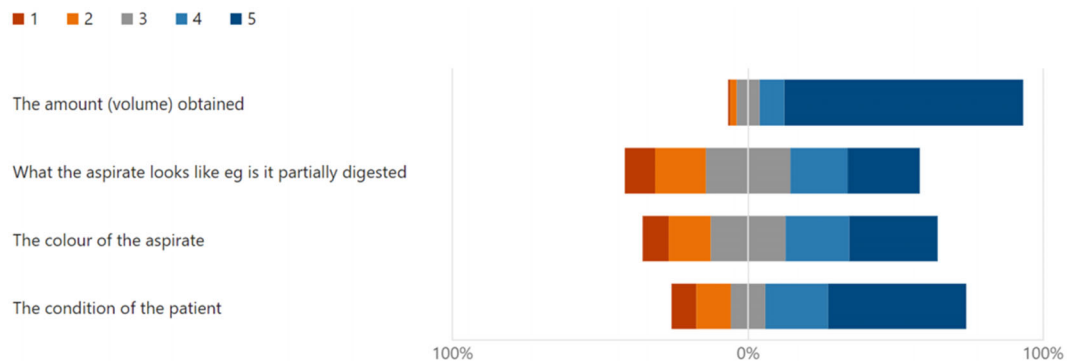


FIGURE 2 Factors related to nurse decision-making around gastric residual volume (GRV) 1 = least important 5 = most important.

“It could be a sign of blockage in the gut and shows that patients are struggling to absorb feed”
[Staff nurse]

“This decision should be multidisciplinary, wherever possible, utilising all of the information used above”.
[Senior Nurse]

3.2 | Factors that affected nurses' decision-making

In relation to factors that affecting nurses' decision-making around withholding feeds based on a high GRV. The **volume of aspirate** was by far the most common response and if cited, the volumes of concern ranged from 200 to 500 mL (mean 350 mL). However, **aspirate appearance** was also identified as being important, specifically whether the aspirate was bilious, faecal, or coffee ground. This was followed by **the overall condition of the patient** (in terms of haemodynamic stability) and if there had been any **recent vomiting**. Many nurses reported **seeking advice for senior staff such as senior nurses, dieticians, or the medical staff**, when making the decision to restart feeds and at what rate.

“I would discuss issue with senior nurse, doctor or dietician (whoever is most appropriate to advise on the specific issue) and follow their plan”. [Staff nurse]

The overall time frame to restart or increased feeds ranged from 2 to 24 h with a mean time of 4 h. The decision for this was most frequently reported as being based on unit protocol, followed by advice from senior staff and including dieticians and medical staff, followed by factors relating to the rate of feed being restarted and any change in the aspirate. Only four staff responded ‘don't know’.

“I'd be guided by medics, but I would aim to restart in four hours at a reduced volume per hour”. [Staff Nurse]

“After medical or dietician review”
[Staff nurse]

“4hrly or as per surgeons or dieticians' advice”
[Staff nurse]

Nurses perceived barriers to delivered enteral feeds.

Nurses perceived barriers to delivering adequate enteral nutrition in ICU fell into five themes.

Fasting for procedures/investigations and treatments was the most common reason cited.

“Holding feed for investigations. Pauses for rehab”
[Staff nurse]

“the patient being off the unit, eg scan, theatre and”
“stopping for scans or procedures”
[Senior Nurse]

This was closely followed by **Increased gastric residual leading to feeds being reduced or stopped**.

A further commonly perceived barrier was **delays in gaining or confirming enteral tube access/position**.

“X-rays not getting checked quickly enough post NG insertion. [Staff nurse].

“Delays in NGT insertion (or re-insertion) and/or delays in prokinetics being prescribed.

“Patients who pull out NG tubes and delays in feed prescribing”. [Senior nurse]

Patient instability was identified as another barrier to delivering adequate enteral feed

“Patients with haemodynamic instability or signs of impaired systematic perfusion”

“Surgical patients/Sedated, paralysed, high risk of re-feed syndrome”. [Senior nurse]

“Patients on high inotropic support”

[Associate nurse]

The final barrier identified was that of Inadequate nurse knowledge or non-compliance with unit protocols

“Lack of education/old fashioned ideas traditions”

[Clinical nurse manager]

“Lack of knowledge eg junior staff that don't follow correct protocols”

[Senior nurse]

“Not following protocol. Lack of awareness of catch-up feeding protocol”

[Staff nurse]

3.3 | Assessing feed tolerance without using GRV

When asked how nurses would assess feed tolerance without using GRV, three main clinical signs were identified: Using clinical signs such as **nausea and vomiting**, considering bowel movement and frequency, and the use of **abdominal signs**: abdominal distention, girth, presence and frequency of bowel sounds [Figure 3] A few (12.4% 34/273) nurses stated that did not know what they could use without GRV. Of these, 14 (41%) were senior nurses, with half (50%) of these having a specialist ICU nursing qualification and these uncertainties were reflected across all four ICUs.

4 | DISCUSSION

This study found that adult ICU nurses' decision-making around GRV measurement is impacted by common fears, some inaccurate

knowledge and general misconceptions across all four ICUs. Nurses feared the risk of vomiting with possible pulmonary aspiration the most. Regarding the gastric aspirate itself, the amount (or volume) was the biggest factor affecting the nurse's decision to withhold or reduce feeds, followed by the appearance of the aspirate and then the condition of the patient.

Only two papers have examined nurses' decision-making and views around GRV^{11,13} and one of these is in paediatric intensive care nurses (using the questionnaire this study adapted). Our findings are consistent with this UK survey of paediatric intensive care nurses¹¹ along with possible malabsorption of feeds and medicines, which was also a concern for both. Bolleneni et al surveyed nurses working in adult practice in a North American hospital. They found 'perceived' high GRVs of 100–200 mL often resulted in feeds being withheld, but nurse practice was varied.¹³

All four participating ICUs had regular GRV measurement written into their feeding guidelines and many nurses referred to these. This is interesting, given recent guidance around nutritional care for critically ill adults, ESPEN (2019)¹⁴ and ASPEN guidelines (2022)¹⁵ don't specifically recommend using GRV to guide enteral nutrition (EN). A recent Cochrane systematic review in 2023 casts even more doubt on the evidence for GRV measurement. ESPEN guidance suggests that GRV assessment 'might be helpful at initiation of EN', but not once EN is established, citing a threshold of >500mL in 6 h at which EN probably should be withheld.¹⁴

Nurses' responses overall alluded to their belief in the accuracy of this measurement (GRV). Increasing evidence points to the unreliability and inaccuracy of GRV in emptying the stomach and poor correlation with any GRV thresholds and prevalence of feed intolerance^{15–18} yet nurses (many senior) appear to remain convinced that this is a valid measurement. In fact, a small percentage of nurses, claimed they could not or did not know what parameters they could use to assess feed tolerance without using GRV. Around half of these were senior nurses, which contrasts with single centre paediatric intensive care

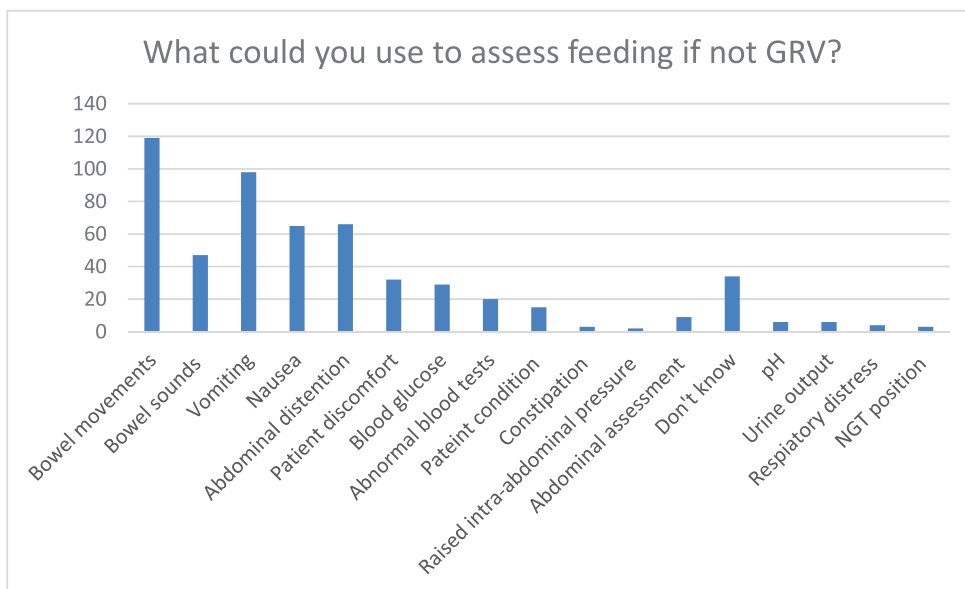


FIGURE 3 Other parameters nurses would use to assess feeding instead of gastric residual volume (GRV).

nurse study,¹¹ in whom it was the junior nurses who struggled the most to consider other ways of assessing feed tolerance. One possible reason for this in senior nurses may be the length of time since their specialist ICU education and this being undertaken prior to the implementation of national (UK) adult ICU nurse competencies.¹⁹ These competencies make no mention of GRV measurement as a tool for assessing feed tolerance but require the nurse to consider other factors.

Most nurses reported concerns around increased risk of vomiting and subsequent pulmonary aspiration. These beliefs are challenged by the available evidence, which shows that whilst the rate of vomiting might be increased when GRV is not monitored, this does not translate to significantly higher rates of aspiration.⁵⁻⁹ Important patient outcomes such as rate of ventilator-associated pneumonia, length of mechanical ventilation, and mortality are unlikely to be affected by not monitoring the GRV.^{8,9}

An interesting finding of our study is that nurses perceived that the greatest barrier to adequate nutritional support was the frequent interruption of enteral feeding as a result of procedures performed in or outside of the ICU. A recent web-survey of UK ICUs showed that only 20% of the units had written guidance on this and that those units with written guidance tended to have shorter fasting times and often no fasting at all, with no observed adverse outcomes.²⁰

Considering most nurses in our study said they would be worried or very worried if they could not measure GRV (again like the paediatric findings), we were interested to see if most would be comfortable in not measuring GRV, if it was part of a large clinical trial.

What is more surprising is that there is already one large multi-centre RCT published in a high-impact journal in 2013,⁵ multiple single-site studies, both RCTs and observational studies and two systematic reviews in critically ill adults,⁶⁻⁹ all showing a lack of evidence for this practice, which may be wasting nursing time and adding to the already high environmental impact of intensive care.²¹ Some studies have also demonstrated a positive nutritional impact of not measuring GRV.⁷ However, any future UK-based national trials must focus on the implementation and behavioural elements of not measuring GRV in this population. Furthermore, all these nursing concerns need to be considered in any future study, as these impact on nurse decision-making, both from an individual and a unit/organizational level.

4.1 | Implications for practice and future research

This study demonstrates that despite robust evidence, showing this practice does not add any clinical value, nursing practice and unit guidelines have failed to de-adopt this practice. This issue of de-adoption or de-implementation of low-value clinical care practices has been highlighted in a recent editorial²² and is one of the future challenges for critical care nursing. The most likely way to change this and de-adopt this practice is through a multicentre active de-implementation study, in which all these nursing concerns and fears identified need to be considered both from an individual and a unit/organizational level.

4.2 | Limitations

This study has some limitations that need to be highlighted. Firstly, as a survey it is open to self-report bias, however, anonymous responses were intended to allow staff to be honest and the lead researcher was external to all organizations. A further limitation of any survey is that responses could not be clarified if unclear. Finally, this study only included four adult ICUs, three in in Northwest England and one in Wales and may be biased towards the three units in England. However, the strengths of our study lie in the acceptable response rates per unit, and high overall responses and in the fact that all respondents answered the free text questions providing large amounts of rich qualitative data.

5 | CONCLUSIONS

Despite increasing evidence and several clinical trials in adults showing the regular measurement of GRV to guide enteral feeding is unnecessary, this practice remains widespread and embedded into UK nurse's practice and decision-making around enteral feeding. This is perpetuated by unit guidelines requiring it, the false belief of the accuracy and reliability of GRV and fear of possible harms by not measuring it. Education around recent evidence-based recommendations alone is unlikely to lead to de-adoption of this embedded practice. Future clinical trials should concentrate on providing behavioural change anchors and robust safety data to enable the reduction of wasteful and time-consuming interventions in critical care.

AUTHOR CONTRIBUTIONS

LT conceived the study, drafted the study protocol, developed the survey instrument and drafted the manuscript. AL, VW, AZ, TS, NT, BJ acted as site study coordinators, secured site approvals and collected data on their sites. All authors reviewed and contributed to the final manuscript.

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CONFLICT OF INTEREST STATEMENT

No authors have any conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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