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RESIDUAL VOLUME MEASUREMENT SHOULD BE RETAINED IN ENTERAL FEEDING PROTOCOLS

By Norma A. Metheny, RN, PhD

In a study reported in this issue, O'Meara and colleagues¹ provide evidence that underfeeding via the enteral route is a serious problem in critically ill patients. Although other researchers²⁻⁵ have reported similar findings, these researchers provide an opportunity to consider where changes could have been made to alleviate the problem.

In their observational study, O'Meara and colleagues found that it took a mean (SD) of 18 (26.9) hours for bedside nurses to insert feeding tubes into the small bowel. This is an area of practice that can be improved. Following a reasonably short training period, a group of critical care nurses were able to insert 339 small-bowel feeding tubes in a time-efficient manner (mean, 22 min; range, 5-180 min).⁶ Therefore, in intensive care settings where postpyloric feedings are commonly used, it behooves each unit to train several nurses in this technique to prevent lengthy delays in starting feedings.

Another preventable reason for feeding interruptions is tube clogging. It is unclear how often clogging occurred in the study, because the authors include this complication in a category with other small-bore feeding tube issues; however, it apparently occurred relatively often. There is evidence that regular flushing can prevent tube clogging. In a study⁷ of 135 critically ill patients, researchers were able to maintain tube patency during more than 1800 residual volume checks merely by flushing the tube with 30 mL of water or isotonic saline following each 4-hour measurement.

About the Author

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Approximately 13% of the feeding interruptions reported by O'Meara et al were due to "increased residual volumes" from either feeding tubes in the small bowel or large-bore tubes in the stomach. It is disappointing that the authors did not provide definitions of "increased residual volumes" in the small bowel and gastric sites. Instead, individual caregivers seem to have arbitrarily chosen values to decide when feedings should be stopped. Some feedings may have been stopped for residual volumes that presented no risk.

Again, this is an area of practice that can be improved. Implementation of a residual volume protocol can eliminate unnecessary feeding interruptions. Such a protocol is predicated on the number of high residual volumes encountered in a specific patient. A single gastric residual volume of 200 mL or more is considered less significant than 2 or more gastric residual volumes in this range.⁸ Unfortunately, rather than reporting the number of increased residual volumes in individual patients, the authors described the frequency of increased residual volumes according to the total number of observations in the 59 patients.

Although specific information about residual volumes was sparse, the investigators reported volumes of 200 mL or more in 22 instances from large-bore orogastric tubes and in 5 instances from small-bore feeding tubes assumed to be positioned in the small bowel. Whereas it is not unusual to find residual volumes of 200 mL or more in the stomach, it is highly unusual to find volumes of this magnitude in the small bowel. Several studies^{9,10} conducted in critically ill patients found that residual volumes from the small bowel were usually less than 10 mL. A few of the small-bowel feeding tubes in the study by O'Meara and colleagues may have dislocated upward into the stomach during the 10-day study period. If so, this could account for the unusually high residual volumes from these tubes.

“ [Despite] recognized problems with obtaining accurate residual volume measurements ... this assessment can help to identify patients at high risk for aspiration and aspiration-related pneumonia. ”

In my opinion, the primary reason for measuring residual volumes from small-bowel tubes is to determine whether the distal portion of the tube has dislocated upward into the stomach. This problem is difficult to detect without the benefit of radiography; therefore, bedside assessments are important for determining when a radiograph is warranted to confirm that a feeding tube has remained in its original position. In a study¹⁰ reported in 2005, the distal tips of 23 of 116 feeding tubes originally positioned in the small bowel were shown by radiography to be displaced upward in the stomach. In 17 of these 23 displaced tubes, a significant increase in aspirate volume was found (mean [SD], 50.7 [16.5] mL; range, 10-330 mL).⁹ Failure to detect dislocation of a small bowel tube into the stomach of a patient with significantly delayed gastric emptying increases risk for aspiration.

Based on their findings, O'Meara et al suggest that residual volume measurement should be abandoned. They recommend other methods such as observing for abdominal distention and absence of bowel sounds. Although both of these observations are frequently made in tube-fed patients, the extent to which either can predict intolerance to tube feedings has not been determined. Critically ill patients may have distended abdomens and hypoactive bowel sounds for reasons other than feeding intolerance. Furthermore, both of these assessments are subjective and difficult to quantify.

I agree that a variety of assessments are warranted to detect feeding intolerance (including listening to bowel sounds and observing for abdominal distention), but I strongly disagree with the authors' recommendation to abandon residual volume measurements. Although there are recognized problems with obtaining accurate residual volume measurements, there is evidence that this assessment can help to identify patients at high risk for aspiration and aspiration-related pneumonia.¹¹⁻¹³ In a study of 153 critically ill patients, Mentec et al¹¹ found that pneumonia occurred more often in patients who had 1 gastric residual volume greater than 500 mL, 2 consecutive gastric residual volumes between 150 mL and 500 mL, or vomiting than it did in patients without these findings (43% vs 24%; $P = .01$). These

authors therefore concluded that assessment of gastric residual volumes is justified to monitor tolerance to enteral feedings.

In a more recent study,¹³ my colleagues and I compared gastric residual volumes in 89 critically ill patients identified as frequent aspirators with gastric volumes in 117 critically ill patients identified as infrequent aspirators. (Aspiration was said to be present when the gastric enzyme pepsin was found in suctioned tracheal secretions; 40% or more of the tracheal secretions in the frequent aspiration group were positive for pepsin.) When residual volumes were entered into a logistic regression analysis with other risk factors for aspiration (including a low level of consciousness, heavy sedation, low head-of-bed elevation, and vomiting), the following gastric residual volume categories were found to occur significantly more often in the frequent aspiration group: 2 or volumes of 200 mL or greater (risk, 2.3; 95% confidence interval [CI], 1.1-5.1), 1 or more volumes of 250 mL or greater (risk, 2.2; 95% CI, 1.0-4.6), and 2 or more volumes of 250 mL or greater (risk, 5.4; 95% CI, 1.1-26.4).

It is unlikely that critically ill patients can receive 100% of their prescribed calories given the multiple unavoidable reasons for feeding interruptions in this population. However, implementation of an enteral feeding protocol that addresses tube placement, tube flushing, and handling of residual volumes might ensure a higher percentage of caloric delivery than that observed in the present study by O'Meara and colleagues.

FINANCIAL DISCLOSURES

None reported.

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