Gastric Residual Volume
End of an Era

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Gastric dysmotility is common in critically ill patients. The pathophysiology is multifactorial including the severity and etiology of the underlying critical illness, use of narcotic analgesia and other sedatives, decreased blood flow from shock, and use of vasopressors. Gastric dysmotility results in delayed gastric emptying that may place patients at risk of developing complications such as vomiting, aspiration, and ventilator-associated pneumonia (VAP). To manage this risk, guidelines recommend monitoring gastric residual volumes (GRVs) on an intermittent schedule and holding enteral feedings when residual volumes exceed certain limits.

The practice of holding or interrupting enteral feedings for elevated GRV developed from a desire to detect intolerance to enteral feeding early and potentially prevent complications from vomiting or aspiration. Two decades ago, McClave et al reported that 30% of critically ill patients experienced GRV greater than 200 mL compared with none of 20 normal control patients. These data convinced many that 200 mL was a reasonable GRV threshold for interrupting enteral feedings. A decade later, Pinilla et al found similar rates of vomiting with a 250-mL threshold compared with a 150-mL threshold although the 150-mL threshold resulted in more than twice as many enteral feeding interruptions (53% vs 23% of patients). Numerous studies have demonstrated that elevated GRV represents the most common reason for enteral feeding interruptions (53% of patients). However, it still was not clear that GRVs alone were clinically important, that they were correlated with gastrointestinal intolerances, or that holding enteral feedings for some arbitrary volume provided any protection from feeding complications. Mentec et al found that more than half of critically ill patients who vomited never had a GRV higher than 150 mL whereas the patients who vomited did so before their GRV had increased to 150 mL (ie, elevated GRV's occurred after vomiting and could not be used to predict vomiting). However, GRV's higher than 500 mL correlated with vomiting but not with increased VAP rates.

In addition, GRVs are dependent on caliber, position, and number of openings of the gastric tube and on patient positioning and, as such, lack reliable reproducibility and do not correlate with either abdominal x-ray or with examination findings. Physiologically, the stomach does not empty continuously. A certain volume of gastric content is necessary to stimulate contractions to facilitate emptying, and that volume varies from person to person. As such, an elevated GRV may simply be physiologic, as suggested by a study demonstrating that 80% of critically ill patients who experienced a GRV greater than 200 mL never had a second episode, despite continuing enteral feeding after the first episode.

Given the data demonstrating safety of higher GRV thresholds and the uncertainty of their clinical utility, the next logical question was whether monitoring GRVs conferred any clinical benefit. In this issue of JAMA, the clinical trial by Reignier and colleagues provides an answer to this question. The investigators randomized 449 adults receiving enteral nutrition via gastric tubes within 36 hours of initiation of mechanical ventilation, 222 of whom were randomized to a protocol in which GRV was checked every 6 hours, with adjustment of enteral feeding rates if the

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Gravitational residual volumes (GRVs) are important in determining the adequacy of enteral feeding rates. However, GRVs are complex to measure and many critical care practitioners expend time and energy trying to rapidly achieve goal enteral feeding rates, which may be better spent on other aspects of critical care.

Despite emerging evidence to the contrary, many enteral feeding protocols continue to interrupt enteral feeding for relatively low GRVs, some with thresholds as low as 150 mL or twice the enteral feeding rate, which may be receiving at the time. Despite this aggressive protocol, overall enteral caloric delivery did not seem to be better than a “ramp up” feeding protocol used in other studies.4-7,10-11 However, starting enteral nutrition this aggressively should favor GRV monitoring if this has clinical benefit. Although the control group received more enteral calories, clinical outcomes were similar, supporting previous studies that have failed to demonstrate improved outcomes with increased amounts of enteral calories.7,8,11 Thus, the time and energy that health care practitioners expend on trying to rapidly achieve goal enteral feeding rates early in the course of critical illness may be better spent on other aspects of critical care.

The study had a number of strengths including its randomized design, relatively large size, and enrollment of a heterogeneous critically ill population from both academic tertiary care and nonacademic community ICUs. However, even though the nature of the study precluded blinding of the bedside nurses and primary care team, VAP episodes were determined by adjudicators blinded to the randomization group. Although the a priori set noninferiority boundary of an absolute 10% difference in rates of VAP is wide, especially given an anticipated VAP rate in the control group of 19%, the results did not approach this boundary, suggesting that not monitoring GRVs was noninferior, or at least not inferior enough to be clinically relevant.

Despite emerging evidence to the contrary, many enteral feeding protocols continue to interrupt enteral feeding for relatively low GRVs, some with thresholds as low as 150 mL or twice the enteral feeding rate, which may be receiving at the time. The finding from the study by Reignier et al should instill confidence in clinicians to change practice and not routinely check GRVs in all patients mechanically ventilated receiving enteral nutrition.

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