Volume-Based Feeding in the Intensive Care Unit, Administering

What Is Volume-Based Feeding in the ICU?
› Volume-based feeding (VBF) is a strategy for achieving daily caloric requirements for enteral feeding based on volume rather than rate. A VBF strategy relies on the total volume of enteral feeding required in a 24-hour period to achieve a patient’s caloric needs, whereas a rate-based strategy depends on a continuous 24-hour infusion rate. A rate-based feeding (RBF) strategy presents challenges in clinical practice because if the enteral feeding is stopped for a period of time and resumed at the same hourly rate, the patient typically does not receive the required calories.

• What: VBF is a strategy based on the volume needed to achieve caloric needs in a 24-hour period for an enteral feeding
• How: After the RBF goal is reached, a VBF strategy can be initiated. After the VBF strategy has been started, if the infusion rate is interrupted the rate is resumed at a rate that will allow for the deficit to be made up with the remaining hours left in the 24-hour period
• Where: In ICU
• Who: Registered dietitians (RD) and certified nutrition support dietitians should be involved in the interprofessional healthcare team that delivers VBF

What Is the Desired Outcome of VBF in the ICU?
› The desired outcome of volume-based feeding in ICU is that the patient receives adequate nutrition to prevent malnutrition and protein catabolism while enhancing the immunological functions of the gastrointestinal (GI) tract

Why Is VBF in the ICU Important?
› Patients in the ICU, especially those on mechanical ventilation, do not typically receive adequate calories and protein through traditional rate-based feeding protocols, so an alternative feeding strategy is important for achieving favorable patient outcomes. Reasons cited in the literature as to why patients in the ICU do not receive adequate nutrition include patient-related factors such as age, sex, nutritional status, severity of illness, and mechanical ventilator support; feeding method factors such as feeding formula and feeding tube site; feeding process factors including initiation of site and time to reach target goal; underprescribing by physicians; and frequent interruptions of enteral nutrition (EN) feeding for a variety of reasons including procedures and tests, GI intolerance, feeding tube problems, and routine nursing procedures (Cahill et al., 2012; Kim et al., 2012)

Facts and Figures About VBF in the ICU
› As a result of an audit of mechanically ventilated hospital ICU patients in Barnes-Jewish Hospital in St. Louis, Missouri, Taylor et al. (2014) conducted a study to assess the effect of VBF on delivering adequate calories and protein to patients in a surgical/trauma ICU (STICU). This study included patients who were mechanically ventilated, stayed in the STICU for at least 7 days, and received at least 72 hours of EN after they attained their goal. Investigators examined data for participants before and after the intervention of the
Feed Early Enteral Diet Adequately for Maximum Effect (FEED ME) protocol and found that the proportion of EN volume, calories, and grams of protein increased, with similar incidence of gastric residual volume. Investigators concluded that the VBF strategy resulted in a significantly increased amount of calories and protein with only a slight increase in diarrhea as a complication.

Researchers in China found that even though critically ill patients received higher amounts of energy on VBF compared with RBF it did not decrease the mortality rate. More important for a positive outcome was receiving at least 65% of their energy needs (Wang et al., 2017)

What You Need to Know Before Implementing VBF in the ICU

RDs must have knowledge of how to initiate and monitor an enteral feeding. Review Dietitian Practice And Skill ... Enteral Nutrition: an Overview in the Nutrition Reference Center. Specifically, RDs must have knowledge of the

- anatomy of the GI tract
- types of enteral feeding tubes
- methods for placing enteral feeding tubes
- enteral formulas
- enteral feeding systems
- recommendations for hang time
- recommendations for flushing enteral tubes
- facility and unit specific procedures for EN administration
- verification of tube placement
- assessment of gastric residual volumes (GRV)
- complications with EN feeding

How to Perform VBF in the ICU

Review patient’s medical chart for diagnosis and history

Estimate patient’s energy needs – see Estimating Energy Requirements in the Nutrition Reference Center

- Energy needs should be determined based on the patient’s severity and type of illness
- Energy requirements can be estimated through simplistic formulas (25-30 kcal/kg/d); predictive equations such as the Harris-Benedict, Mifflin-St. Jeor, and Ireton-Jones; or indirect calorimetry. Predictive equations should be interpreted with caution and clinical judgement, especially in the obese patient. Indirect calorimetry, though not always practical, is the gold standard for estimating caloric needs in the ICU

- Permissive underfeeding or hypocaloric feeding is recommended for critically ill obese patients; when BMI is > 30, the goal of the EN feeding should not exceed 11–14 kcal/kg/actual body weight

Estimate patient’s protein needs

- Protein needs should be determined based on the patient’s severity and type of illness
  - For BMI < 30, 1.2–2.0 g/kg/actual body weight should be provided; higher amounts of protein are needed for burn or multi-trauma patients
  - For BMI of 30–40, ≥ 2.0 g/kg/IBW
  - For BMI of ≥ 40, ≥ 2.5 g/kg/IBW

Select appropriate enteral feeding based on patient’s needs

Initiate enteral tube feeding based on RBF institution and unit protocol

- Generally, tube feeding (TF) can be initiated at rates from 20–50ml/hour and advanced by 10–25 ml every 4–24 hours

Once TF goal has been reached, VBF strategy can be initiated

- Determine volume-based enteral feeding goal; i.e., the amount of enteral formula needed to obtain the desired amount of calories in 24 hours
  - Any interruption in feeding requires a reassessment and recalculation to make up for feeding time lost
  - The volume of enteral feeding already delivered before the feeding was stopped is subtracted from the total volume needed for 24 hours

Update the patient's plan of care, as appropriate, and document the following in the patient's medical record:

- Estimated goal for calories and protein requirements
- RBF goal including initiation rate and advancement routine
- VBF goal including rate and plan for attaining volume required if feeding is stopped during a 24-hour period
• Plan for holding enteral feeds if GRV exceeds 500 ml or institution/unit protocols

Other Nutritional Interventions That May Be Necessary Before or After VBF
› Verification of tube placement, see NURC Enteral Nutrition: An Overview

What to Expect AfterInitiating VBF in the ICU
› Patient should be able to more closely reach his or her caloric and protein goals in comparison to a RBF strategy

Red Flags
› Patient’s GRVs should be monitored closely and need to be liberalized when using a VBF
• Generally, holding EN feeding for GRV of < 500 ml in the absence of other signs of intolerance is not necessary
› Initiating the use of a motility agent may be helpful at the start of the VBF strategy

What Do I Need to Tell the Patient/Patient’s Family?
› VBF strategies are used to ensure patients receive adequate calories and protein while in the ICU. Current studies indicate that VBF strategies are safe and lead to greater caloric and protein intake in comparison to RBF

References