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Optimizing Nutrition in Intensive Care Units

Empowering Critical Care Nurses to Be Effective Agents of Change

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Posted: 05/23/2012; Am J Crit Care. 2012;21(3):186-194.

Abstract and Introduction

Abstract

Observational studies have consistently revealed wide variation in nutritional practices across intensive care units and indicated that the provision of adequate nutrition to critically ill patients is suboptimal. To date, the potential role of critical care nurses in implementing nutritional guideline recommendations and improving nutritional therapy has received little consideration. Factors that influence nurses' nutritional practices include the lack of guidelines or conflicting evidence-based recommendations pertaining to nurses' practice, strategies for implementing guidelines that are not tailored to barriers nurses face when feeding patients, strategies to communicate best evidence that do not capitalize on nurses' preference for seeking information through social interaction, prioritization of nutrition in initial and continuing nursing education, and a lack of interdisciplinary team collaboration in the intensive care unit when decisions on how to feed patients are made. Future research and quality improvement strategies are required to correct these deficits and successfully empower nurses to become nutritional champions at the bedside. Using nurses as agents of change will help standardize nutritional practices and ensure that critically ill patients are optimally fed.

Introduction

Critically ill patients have increased metabolic requirements[1] and rely on the administration of nutritional feedings to meet increased demands. Observational studies[2–4] have revealed that, compared with patients who receive more nutrition, patients who receive less are more likely to experience adverse events such as increased infectious complications and higher mortality. Despite recognition of the importance of nutritional feedings, the delivery of optimal nutrition remains difficult to achieve in most intensive care units (ICUs).[5] Both underprescription[6] and underdelivery of feedings[7,8] may contribute to iatrogenic malnutrition in critically ill patients.

Almost all discussions of nutritional support focus on the knowledge, attitudes, and behavior of dietitians and/or physicians. However, critical care nurses are well positioned to influence and implement evidence-based nutritional practice. As the primary care provider for critically ill patients, nurses are responsible for ongoing assessment of patients: contributing to and implementing treatment plans, monitoring and evaluating a patient's response to such plans, and revising the treatment plan in response to changes in the patient's clinical manifestations. For nutritional therapy, nurses have an important role in identifying nutritional risk, assessing the adequacy of access for nutritional therapy, starting and managing enteral or parenteral nutritional feedings, and monitoring patients for potential complications.[9,10] The studies[11–15] on nurses' perception of responsibility, knowledge, documentation, and practice specific to enteral nutrition in the ICU have indicated wide variability that can contribute to suboptimal delivery of nutritional therapy.

In this review, we highlight and identify factors that influence nurses' nutritional practice and discuss how these factors may contribute to the observed variability in current nutritional practice. Potential factors include the content of existing evidence-based guidelines, the implementation of guideline recommendations, perceived importance of nutrition, collaborative decision making among the interdisciplinary team, and nurses' preferred learning behavior via social interaction. A greater understanding and recognition of these factors are essential for successful advancement of the practice of nursing and the professional development of nurses in feeding

critically ill patients.

Evidence-based Enteral Feeding Guidelines and Nursing Practice

Evidence-based guidelines for critical care are useful in supporting clinical decisions,[16] and evidence-based guidelines specific to the provision of enteral nutrition in critical care[17,18] and comprehensive guidelines for enteral nutrition practice relevant to many areas of clinical practice[19] are available. Some studies[20,21] point out the improvement in caloric intake and standardization of practice due to using nutrition-specific guidelines and protocols, although large gaps between recommendations from such guidelines and actual clinical practice have also been described.[5] Nevertheless, the development of nutrition-specific guidelines for critical care is an important step to providing synthesized, research-based recommendations that inform decisions at the bedside with the aim of improving nutritional intake for a group of patients at high risk for iatrogenic malnutrition.

Critical care nurses who wish to use these guidelines to direct nursing practice face some challenges. At least 6 current evidence-based guidelines developed through professional organizations and reputable researchers are available, and although this number presents choice, it may also introduce confusion and uncertainty in selecting an appropriate guideline for clinical practice. A reasonable expectation is that nurses will select and use the guideline or guidelines that best accommodate the value set, culture, and product availability of the clinical area in which the nurses are working.[22] Consequently, nurses may determine that the guideline originating from their regional area is most suitable for their clinical practice, with selection most likely influenced by ease of access.

Where guidelines are readily available, their usefulness for nursing practice may be low because many aspects of enteral feeding for which nurses are responsible have insufficient evidence to enable strong recommendations or are simply not addressed within the guidelines. Table 1 provides a summary of practice recommendations from the available guidelines most pertinent to nursing practice. Clearly, many of the enteral nutrition guidelines[17,18,23,24] specific for critical care provide few recommendations for nurses' practice. For example, the guidelines provide no information on techniques for inserting feeding tubes, assessing placement of the tubes, and maintaining tube patency. Although these issues are addressed in general enteral nutrition practice recommendations,[19] the underlying evidence base is often weak, highlighting the need for high-quality studies, such as prospective randomized trials, to support the recommendations. These apparent gaps in knowledge have resulted in omission in the guidelines of recommendations on many topics specific to nurses' practice and emphasize the need for and the importance of nurse-initiated, multidisciplinary research in these specific areas.

Table 1. Summary of enteral feeding management issues inadequately addressed by published guidelines

Issue	Information available in evidence-based guidelines
Tube insertion techniques	Not addressed in critical care–specific guidelines.[17,18,23,24] Nasojejunal route for enteral feeding in intensive care patients is not required unless patient does not tolerate gastric feeding.[19] Long-term feeding devices should be considered when the need for enteral feeding is at least 4 weeks in adults, children, and infants after term age.[19] Evaluation by a multidisciplinary team is indicated before insertion of a long-term feeding device to establish whether a. benefit outweighs the risk of access placement, b. insertion of feeding tubes near end of life is warranted, or c. insertion of feeding tubes is indicated when patients are close to achieving oral feeding.[19] Document tube type, tip location, and external markings in the medical record and in follow-up examinations.[19]

	Avoid placement of catheters or tubes not intended for use as enteral feeding devices, such as urinary or gastrointestinal drainage tubes, which usually lack an external anchoring device. Use of such tubes leads to enteral misconnection as well as tube migration, which can potentially cause obstruction of the gastric pylorus or small bowel and aspiration.[19]
Placement confirmation	Not addressed in critical care–specific guidelines.[17,18,23,24] Obtain radiographic confirmation that any blindly placed tube is properly positioned in the gastrointestinal tract before initial use of the tube for administering feedings and medications in adult patients.[19] When attempting to insert a feeding tube into the stomach of an adult patient, capnography may be helpful to detect inadvertent entry of the tube into the trachea. Be aware that a radiograph is still needed before the tube is used for feeding.[19] When attempting to insert a feeding tube into the small bowel, observe for a change in the pH and in the appearance of aspirates as the tube progresses from the stomach to the small bowel; use the findings to determine when a radiograph is likely to confirm small-bowel placement.[19] In adult patients, do not rely on the ausculatory method to differentiate between gastric and respiratory placement.[19] Do not rely on the ausculatory method to differentiate between gastric and small-bowel placement.[19] Mark the exit site of a feeding tube at the time of initial radiography; observe for a change in the external length during feedings. If a marked increase in the external length is observed, use other bedside tests to help determine if the tube has become dislocated. If in doubt, obtain a radiograph to determine tube location.[19]
Maintaining tube patency	Not addressed in critical care–specific guidelines.[17,18,23,24] Flush feeding tubes with 30 mL of water every 4 hours during continuous feeding or before and after intermittent feeding.[19] Flush the feeding tube with 30 mL of water after measurements of residual volumes.[19] Sterile water is recommended before and after administration of medication.[19] Adhere to protocols that call for proper flushing of tubes before and after administration of medications.[19] Use an administration pump when slow rates of feeding with enteral formula are required.[19] Use sterile water for tube flushes in immunocompromised or critically ill patients, especially when the safety of tap water cannot be reasonably assumed.[19]
Monitoring feeding tolerance	On the basis of 1 level-2 study and 2 cluster-randomized controlled trials, an evidence-based feeding protocol that incorporates a higher gastric residual volume (250 mL) should be considered as a strategy to optimize delivery of enteral nutrition in critically ill adult patients.[17] Holding enteral nutrition for gastric residual volumes less than 500 mL in the absence of other signs of intolerance should be avoided.[23] Evaluating gastric residual volume in critically ill patients in an optional part of a monitoring plan to assess tolerance of enteral nutrition. Enteral nutrition should be withheld when a gastric residual volume greater than or equal to 250 mL is documented on 2 or more consecutive occasions. Withholding enteral nutrition when the gastric residual volume is less than 250 mL is associated with delivery of less enteral nutrition. Gastric residual volume may not be a useful tool to assess the risk of aspiration pneumonia. Adequately powered studies have not been conducted to evaluate the impact of gastric residual volume on aspiration pneumonia.[24]

	Feeding intolerance with a gastric residual volume exceeding 200 mL has been reported, but no valid evidence on clinically meaningful outcomes is available.[18] Check gastric residual volumes every 4 hours during the first 48 hours for gastrically fed patients.[19] If the gastric residual volume is 250 mL or more after a second gastric residual check, use of a promotility agent should be considered.[19] A gastric residual volume exceeding 500 mL should result in withholding enteral nutrition and reassessing the patient's tolerance by use of an established algorithm that includes physical assessment, gastrointestinal assessment, evaluation of glycemic control, minimization of sedation, and consideration of use of a promotility agent, if not already prescribed.[19]
Rate and method of administration of feedings	Evidence is insufficient to make a recommendation on enteral feedings given continuously vs other methods of administration in critically ill patients.[17] For high-risk patients or patients intolerant to gastric feeding, delivery of enteral nutrition should be switched to continuous infusion.[23] The delivery method and initiation and advancement of enteral nutritional regimens should be based on the patient's condition, age, enteral route, nutritional requirements, and gastrointestinal status.[19] Choose full-strength, isotonic formulas for the initial feeding regimen.[19] Enteral feedings should be started postoperatively in surgical patients without waiting for flatus or a bowel movement. The current literature indicates that these feedings can be initiated within 24 to 48 hours of surgery.[19]
Monitoring for complications	Blue dye should not be added to enteral nutrition for detection of aspiration. The risk of using blue dye outweighs any perceived benefit. The presence of blue dye in tracheal secretions is not a sensitive indicator of aspiration.[24]
Minimizing risk of complications, aspiration	Critically ill patients receiving enteral feedings should have the head of the bed elevated to 45º. If such elevation is not possible, attempts to raise the head of the bed as much as possible should be considered.[17] In all intubated intensive care patients receiving enteral feedings, the head of the bed should be elevated 30° to 45°. [23] In order to decrease the incidence of aspiration pneumonia and reflux of gastric contents into the esophagus and pharynx, critically ill patients should have the head of the bed elevated 45º if elevation is not contraindicated.[24] Monitor all enterally fed patients for risk of aspiration.[19] Elevate the backrest to a minimum of 30°, and preferably to 45°, for all patients receiving enteral nutrition unless a medical contraindication exists.[19] Use the reverse Trendelenberg position to elevate the head of bed unless contraindicated, when a patient cannot tolerate backrest elevation.[19] If necessary to lower the head of bed for a procedure or because of a medical contraindication, return the patient to a position with the head of the bed elevated as soon as feasible.[19]
Minimizing risk of complications, diarrhea	Development of diarrhea associated with enteral tube feedings warrants further evaluation for cause of the problem.[23]
Management of feeding equipment	Data are insufficient to make a recommendation on the administration of enteral feedings via a closed vs an open system in critically ill patients.[17] Sterile, decanted formula should be administered over a period of 8 hours.[19] Administration sets for open-system enteral feeding should be changed at least every 24 hours.[19]

	Closed-system enteral nutrition formulas can be delivered over a period of 24 to 48 hours.[19] Administration sets for closed enteral nutrition systems should be changed per manufacturer's guidelines.[19]
Withholding enteral nutrition before diagnostic tests	The time that a patient is given nothing by mouth before, during, and immediately after the time of diagnostic tests or procedures should be minimized to prevent inadequate delivery of nutrients and prolonged periods of ileus.[23]

Practice recommendations from different guidelines may also contain conflicting recommendations. The apparent lack of agreement between the guidelines for some topics has been extensively described by Dhaliwal et al,[25] and we highlight the specific areas of conflict most relevant to nursing practice in Table 1. One topic with wide variability in clinical practice on which the published guidelines do not agree is the measurement of gastric residual volume as a strategy for determining feeding tolerance.[14] This lack of agreement may compound, rather than resolve, clinical uncertainty and may contribute to variations in nursing practice. In particular, the links between high gastric residual volume and aspiration[26] or the development of pneumonia[27] often cause clinicians concern, yet not all studies support this association.[28]

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Implementing the Recommendations of Nutritional Guidelines

Although published evidence-based guidelines for enteral feeding are intended to be the basis for practice and clinical decisions and should reduce practice variability and contribute to improvements in protein-calorie intake, the direct use of such guidelines in daily critical care nursing practice is unlikely. Most likely evidence-based guidelines for enteral feeding have been adapted to the local context to improve acceptance and adherence.

Examples of local adaptation of guidelines include incorporation of recommendations in hospital policy documents, order sets, bedside algorithms, decision trees, and care pathways. However, when guidelines are customized for local use, the evidentiary base may become difficult for nurses to identify or may be weakened if systematic approaches to adaptation are not followed.[29]

Evidence suggests that incorporating guideline recommendations into nurse-initiated protocols for starting and advancing enteral feedings is an effective strategy to improve the delivery of nutritional feedings.[30,31] After local adaptation, implementation strategies are also required to promote adherence to these guidelines by clinicians who are responsible for direct patient care.[32] Some evidence[33,34] suggests that implementation strategies that identify and take into account barriers to changing practice have a higher likelihood of success than strategies that do not. In the context of nutritional therapy, barriers are any reasons that prevent patients from receiving adequate nutrition. To gain a better understanding of the barriers that affect adherence to nutritional guidelines in the ICU, Jones et al[11] conducted multiple case studies in 4 ICUs in Canada and incorporated the results into a framework outlining the factors that influence implementation of guidelines for critical care providers, including the characteristics of the guidelines, the implementation strategy, institutional factors, the behavior of individual providers, and a patient's clinical condition. Jones et al also found that the magnitude of these barriers varied across different ICUs and groups of health care professionals (ie, physicians vs nurses vs dietitians). Thus, efforts should be made to identify and understand the specific barriers nurses face in feeding critically ill patients.

Another important consideration in implementing nutritional guidelines is recognizing the evidence that suggests nurses[35–37] and other health professionals[38,39] prefer information obtained through social interaction and that when these care providers are engaging in direct patient care, electronic and text-based resources are less often accessed when information is required to resolve clinical uncertainty.[40] The preference for information through social interaction as opposed to that obtained from the published literature, including research and clinical practice guidelines, should not automatically be viewed as a problem. Rather, this approach to decision making may represent the need to integrate complex information and current research from a variety of sources and apply the information to problem solving within a rapidly changing and complex clinical environment. The implementation strategies for nutritional policies and guidelines must incorporate the use of clinically credible colleagues who have the requisite knowledge to facilitate the incorporation of guideline or policy information into clinical practice. Thus, the development of nursing resource persons with nutritional expertise should be considered a key strategy to enhance the use of information to support clinical decisions on nutritional therapy. Therefore, if the intent is to use guidelines as a strategy to standardize and improve practice, consideration must be given to the ways in which this information is transferred within the clinical setting, and the value of developing strong and comprehensive communication strategies that incorporate acquisition of information through social interaction must be acknowledged.[41,42]

Prioritizing Enteral Nutrition in Critical Care Nursing Practice

Critical care nurses are required to integrate the recommendations of evidence-based guidelines for nutritional therapy into the care of patients within rapidly changing clinical contexts and competing demands on the nurses' time. Successful integration of these recommendations requires prioritizing care, but how or why prioritizing occurs is not clear.

Nutrition is often promoted as an important supportive component of fundamental nursing care, that is, nutrition is important for metabolism, growth, and repair. However, the importance of nutrition as a therapeutic strategy associated with the administration of pharmacologically acting nutrients[43] that results in improved outcomes for patients may not be as well recognized. If so, then nutrition, particularly enteral nutrition, may not be regarded the same as other therapeutic strategies, such as use of antibiotics or the administration of other medications. The consequence may be that nutrition has a lower priority than do other aspects of nursing practice, and this low priority may contribute to the development of iatrogenic malnutrition.

The lack of recognition of the importance of nutrition as a therapy could be attributed to a lack of knowledge.

Some limited evidence suggests knowledge deficits specific to nutritional therapy exist for both physicians[44] and nurses[45,46] in critical care. These potential knowledge deficits highlight the importance of ensuring integration of nutrition-specific education into student nursing programs and as an integral part of ongoing continuing education, particularly because nurses have considered nutrition a low-priority topic.[47] Further, academic programs that specialize in critical care nursing should include nutritional therapy as a key component of the curriculum.

Prioritization of nutrition is equally important in nursing research. A search of leading critical care nursing journals (keywords: *enteral nutrition* AND *nursing* AND *critical care*) revealed only 132 publications specific to enteral nutrition published since 2000. Of these publications, most were commentaries or literature reviews, and at best, only 1% of research articles in any single journal were related to enteral nutrition (Table 2). Of course, other avenues are available to publish the results of research on enteral nutrition, and because of the multidisciplinary nature of nutritional therapy, many of the results appear in journals specific to nutrition or critical care medicine. However, the low number of publications does highlight the dearth of new knowledge on enteral nutrition being generated by and for nurses and also raises a question about communicating research findings to nurses who may not regularly access publications other than nursing journals.

Table 2. Number of enteral nutrition publications in critical care nursing journals from 2000 to 2010

	No. (%) of publications		
Journal	**Total**	**Related to enteral nutrition**	**Research on enteral nutrition**
Dimensions of Critical Care Nursing	707	10 (1.4)	2 (0.3)
Australian Critical Care	526	11 (2.1)	2 (0.4)
Intensive and Critical Care Nursing	605	19 (3.1)	6 (1.0)
American Journal of Critical Care	1043	23 (2.2)	14 (1.3)
AACN Advanced Critical Care	225	5 (2.2)	1 (0.4)
Critical Care Nurse	1650	10 (0.6)	4 (0.2)
Heart and Lung	731	1 (0.1)	0 (0.0)
Critical Care Nursing Clinics of North America	583	13 (2.2)	0 (0.0)
Dynamics: The Journal of the Canadian Association	145	0 (0.0)	0 (0.0)
of Critical Care Nurses			
Nursing journal (not critical care)		5	4
Medical journal (critical care)		5	4
Other health professional journal		2	1
Total	6215	104	38

Collaborative Decision Making in Nutritional Support

Of note, the delivery of nutritional therapy to critically ill patients is a collaborative effort and not just the responsibility of critical care nurses. Determining nutritional requirements, prescribing appropriate nutritional

therapy, and ensuring delivery of the therapy involves many health care professions, including, but not limited to, nurses, dietitians, and physicians. The different roles and responsibilities of each profession require an approach based on interprofessionalism, or "the process in which professionals from different disciplines collaborate in an integrated approach to patient care,"[48] (p2)] to ensure delivery of adequate nutrition to critically ill patients. In order to foster collaboration, the interprofessional approach to nutritional therapy must occur in a supportive organizational environment and include integrated and cohesive care and symmetrical power.[11,48,49] For collaboration between nurses, dietitians, and physicians to be effective, the 3 groups must share a common goal of improving nutritional outcomes for critically ill patients and have a clear understanding of each group's role.[50,51] Evaluating the extent to which this collaboration occurs could be an important factor in improving nutritional outcomes and is an important area for future research.

Collaboration in nutritional support is important and should incorporate the establishment and attainment of nutritional goals. Such collaboration should also extend to education and research on nutrition. Such an example of collaboration is evident in the multidisciplinary teams involved in the development of guidelines.[17,19,23]

Conclusion

Enteral nutrition is an important therapeutic strategy for improving the outcomes of critically ill patients, and critical care nurses play an important role in ensuring that set nutritional targets are met for patients. The development of evidence-based enteral feeding guidelines is one important step to a consistent approach in practice to ensure adequate prescription and delivery of nutritional therapy. To date, health care providers have not capitalized on the potential role of critical care nurses in improving nutrition practice. Some specific suggestions to improve this situation include the following:

- Recognize the gaps in research to support nutrition-related nursing practice.
- Effectively engage, as a member of a multidisciplinary team, in the development of synthesized nutrition resources to ensure that aspects of nutrition practice relevant to nursing practice are incorporated into evidence-based nutritional guidelines.
- Implement enteral feeding guidelines by using a systematic approach aligned with the local context and ways of practicing.
- Assess barriers to evidence-based nutritional strategies that are specific to a clinical area.
- Use social interaction and develop social networks to disseminate guidelines in the clinical area.
- Recognize the importance of nutrition as a therapy for improving the outcomes of critically ill patients and prioritize nutrition accordingly.
- Collaborate as a member of the multidisciplinary team in nutrition-related clinical practice, education, and research.

Taking steps to accomplish these goals will help engage and empower nurses to be effective agents of change, as they strive to optimize the nutrition received by critically ill patients.

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Acknowledgments
Naomi Cahill is the recipient of a fellowship in Knowledge Translation from the Canadian Institutes of Health Research.

Am J Crit Care. 2012;21(3):186-194.