

- [Critical Illness](#)
- [Critical Illness \(CI\) Guideline \(2012\)](#)

# Critical Illness

## CI: Introduction (2012)

Guideline Overview

Guideline Title

Critical Illness (2012) Evidence-Based Nutrition Practice Guideline

Guideline Narrative Overview

The focus of this guideline is on the nutrition care of the critically ill adult patient who requires nutrition support. The goals of nutrition support in well-nourished and malnourished critically ill patients are to minimize physiologic deterioration and promote anabolism and recovery. Clinical judgment is crucial in the application of this guideline.

### Guideline Development

This guideline outlines the most current information on nutrition support practice in the critically ill patient. The recommendations developed in this guideline were based upon a systematic review of the literature in multiple practice areas. A summary of the evidence analysis is below:

Topics include:

- Determining Resting Metabolic Rate
- Enteral vs. Parenteral Nutrition
- Initiation of Enteral Nutrition
- Feeding Tube Site
- Enteral Nutrition Energy Delivery
- Blue Dye Use
- Optimizing Enteral Nutrition Delivery
- Immune-Modulating Enteral Nutrition
- Enteral Nutrition and Fiber
- Supplemental Enteral and Intravenous Glutamine
- Hypocaloric, High Protein Feeding Regimen
- Blood Glucose Control

The number of supporting documents for these topics is below:

- *Recommendations:* 22
- *Conclusion Statements:* 136
- *Evidence Summaries:* 116
- *Article Worksheets:* 190.

At the time of this publication, the majority of research has been completed in the adult population; therefore, clinical judgment is crucial in the application of these guidelines for individuals in other age groups and settings.

### Guideline Development

To learn about the Academy systematic review and guideline development and review process, visit the [Policy and Process](#) section.

### Application of the Guideline

This guideline will be accompanied by a set of companion documents (i.e., a toolkit) to assist the practitioner in applying the guideline. The toolkit will contain outcomes management tools, resources and case studies. The toolkit is currently under development and will undergo pilot-testing through the Academy of Nutrition and Dietetics Dietetic Practice-Based Research Network prior to publication.

### Revision

All Academy guidelines are revised every five years. The literature search will begin for each guideline topic three years after publication to identify new research that has been published since the previous search was completed. An expert work group will convene to determine the need for new and revised recommendations.

### Medical Nutrition Therapy and Critical Illness

Medical and surgical conditions where the critical illness guideline may apply include those in which the patient requires care in an intensive care unit (ICU), such as:

- Sepsis and systemic inflammatory response syndrome (SIRS)
- Trauma
- Neurological injury such as traumatic brain injury, stroke, ALS, etc.
- Pancreatitis
- Respiratory failure
- Multi-organ failure
- Surgery.

New research may warrant a revision to a specific question or recommendation prior to the full project or guideline revision. Once identified, information is gathered and the EAL oversight committee will make a decision on the appropriate action.

### Populations to Whom This Guideline May Apply

Scientific evidence supports the importance of the Registered Dietitian (RD) as a member of the interdisciplinary team caring for critically ill adults.

The RD plays an integral role on the interdisciplinary care team by determining the optimal nutrition prescription and developing the nutrition care plan for critically ill patients in all phases of illness. Based on the patient's clinical status, plan for treatment, comorbidities, the dietitian monitors and evaluates the effectiveness of the nutrition care plan in promoting the patient's nutritional health and quality of life. The dietitian adjusts the nutrition care plan as necessary to achieve desired outcomes.

### Study Limitations

Some ICU studies are limited by small sample size or the lack of statistical power analyses. These limitations may be reflected in statements made in reviewing evidence summaries, conclusions and associated grades of evidence. Performing power analysis and sample size estimation is an important aspect of designing a research study, because without these calculations, the number of subjects recruited for a specific research question may be too few. When the sample size is too small, the study will lack the precision to provide reliable answers to the questions it is investigating.

Power is broadly defined as the probability that a test having statistical significance will reject the null hypothesis for a specified value of an alternative hypothesis. Stated more simply, power may be defined as the ability of a test to detect an effect, given that the effect actually exists.

### Other Guideline Overview Material

For more details on the guideline components, use the links on the left to access:

- Scope of Guideline
- Statement of Intent and Patient Preference
- Guideline Methods
- Implementation of the Guideline
- Benefits and Harms of Implementing the Recommendations.

#### Contraindications

This guideline should not be used when aggressive medical care is no longer desired. The appropriateness of a clinical intervention involves a substantial element of personal choice or values of the patient, which includes advance directives. Although nutrition support is often warranted for the critically ill patient, occasionally, support may be contraindicated due to the patient's clinical status or patient preference. Therefore, a comprehensive nutrition assessment and ongoing reassessment is necessary to determine whether the initiation or continued provision of support is appropriate.

#### References

1. Vrees MD, Albina JE. Metabolic response to illness and its mediators. *Clinical Nutrition: Parenteral Nutrition*, Rombeau JL, Rolandelli RH (eds). WB Saunders, Philadelphia, 2000, pp. 21, 034.
2. A.S.P.E.N. Board of Directors: Guidelines for the use of parenteral and enteral nutrition in adult and pediatric patients. *J Parenter Enteral Nutr.* 26 (suppl) 1S, 2002.
3. Compher C, Frankenfield D, Keim N, Roth-Yousey L. for the Evidence Analysis Working Group. Best practice methods to apply to measurement of resting metabolic rate in adults: a systematic review. *J Am Diet Assoc.* 2006; 106: 881-903.

- [Critical Illness](#)
- [Critical Illness \(CI\) Guideline \(2012\)](#)
- [CI: Introduction \(2012\)](#)

## Critical Illness

### CI: Scope of Guideline (2012)

#### Guideline Scope Characteristics

Below you will find a list of characteristics that describe the Scope of this Guideline.

#### Disease/Condition(s)

The purpose of this guideline is to provide an evidence-based summary of effective practice in the nutrition management for the [critically ill](#).

Recommendations have been formulated to promote positive clinical outcomes specific to clinical practice decisions pertinent to nutrition of the critically ill. The major focus of this guideline is to provide protocols for the delivery and monitoring of [enteral nutrition](#) (EN) support.

The Guideline is intended to be used by dietetic practitioners involved in the nutritional care of the critically ill. Dietetic practitioners in non-critical care settings or alternative healthcare settings may also find this guideline helpful for patients requiring [EN](#) or [PN](#). The guidelines are intended to provide healthcare practitioners with direction based on the current science for nutrition of the critically ill in order to promote positive clinical outcomes.

#### Guideline Category

Assessment of Therapeutic Effectiveness, Treatment

#### Clinical Specialty

Critical Care, Nutrition

#### Intended Users

Registered Dietitians, Advanced Practice Nurses, Health Care Providers, Nurses, Pharmacists, Physician Assistants, Physicians, Respiratory Care Practitioners, Speech-Language Pathologists, Students

#### Guideline Objective(s)

##### Overall Objective

- To provide [MNT](#) guidelines for nutrition of the [critically ill](#) to enhance delivery and reduce complications.

##### Specific Objectives

- To define evidence-based recommendations for the provision of [EN](#) by registered dietitians (RDs) in collaboration with other healthcare providers
- To guide practice decisions that integrate medical and nutritional elements
- To reduce variations in practice among [RDs](#)
- To provide the RD with evidence-based practice recommendations to adjust the [MNT](#) or recommend other therapies to achieve positive outcomes
- To enhance the quality of life (QoL) for the patient, utilizing customized strategies based on the individual's nutritional needs
- To promote optimal nutrition support within cost constraints of the healthcare environment.

#### Target Population

Adult (19 to 44 years), Middle Age (45 to 64 years), Aged (65 to 79 years), Male, Female

#### Target Population Description

[Adult critically ill](#) patients requiring or eligible for [EN](#) support in the intensive care unit (ICU). The evidence for the guideline did not specifically examine populations that were exclusively patients with burns. These guidelines are not applicable to pediatric populations.

#### Interventions and Practices Considered

The [Critical Illness](#) guideline is based on the Academy of Nutrition and Dietetics' Nutrition Care Process and Model, which involves the following steps. Terms relevant to the treatment of [critically ill](#) patients come from the *International Dietetics & Nutrition Terminology (IDNT) Reference Manual: Standardized Language for the Nutrition Care Process. Third Edition*.

- [Nutrition Assessment](#)
- [Nutrition Diagnosis](#)
- Nutrition Intervention
- Nutrition Monitoring and Evaluation.

This guideline addresses topics that correspond to the following areas of the Nutrition Care Process.

## I. Referral to a Registered Dietitian

## II. Medical Nutrition Therapy

### A. Nutrition Assessment

Below are the nutrition assessment terms related to [critical illness](#) from *International Dietetics & Nutrition Terminology Reference Manual: Standardized Language for the Nutrition Care Process, Third Edition*.

- Food/nutrition-related history to include nutrient intake, nutrient administration, and factors affecting access to nutrition support-related supplies
- Nutrition-focused assessment including:
  - Anthropometric measurements
  - Biochemical data, medical tests and procedures
  - Nutrition-focused physical findings
  - Client history to include medical history and treatments.

### B. Nutrition Diagnosis

Below are common nutrition diagnoses related to critical illness from *International Dietetics & Nutrition Terminology Reference Manual: Standardized Language for the Nutrition Care Process, Third Edition*.

- Inadequate energy intake
- Excessive energy intake
- Inadequate oral intake
- Inadequate intake from [EN](#) or [parenteral nutrition](#) (PN) infusion
- Excessive intake from EN or [PN](#) infusion
- Less than optimal EN or PN infusion
- Malnutrition
- Altered [GI](#) function.

### C. Nutrition Intervention (Planning and Implementation)

Below are the nutrition interventions related to critical illness from *International Dietetics & Nutrition Terminology Reference Manual: Standardized Language for the Nutrition Care Process, Third Edition*.

Individualized [nutrition prescription](#) based on current reference standards and dietary guidelines and the patient/client's health condition and nutrition diagnosis:

- Formula/solution
- Insert enteral feeding tube
- Site care
- Feeding tube flush
- [IV](#) Fluids
- Nutritional needs of patient
- Medical status
- Current clinical status.

### D. Monitoring and Evaluation

Monitoring and evaluation are critical components in reassessing the adequacy and success of the nutrition support intervention.

Below are the nutrition monitoring and evaluation terms related to critical illness from *International Dietetics & Nutrition Terminology Reference Manual: Standardized Language for the Nutrition Care Process, Third Edition*.

- Individualized prescription based on monitoring criteria for tolerance of [EN](#).
- Nutrient intake
- Nutrition-related [ADLs](#) and [IADLs](#)
- Nutrition-focused physical findings.
- Body composition/growth/weight history.

- [Critical Illness](#)
- [Critical Illness \(CI\) Guideline \(2012\)](#)
- [CI: Introduction \(2012\)](#)

# Critical Illness

## CI: Statement of Intent (2012)

### Statement of Intent

Evidence-based nutrition practice guidelines are developed to help dietetic practitioners, patients and consumers make shared decisions about health care choices in specific clinical circumstances. If properly developed, communicated and implemented, guidelines can improve care.

While they represent a statement of best practice based on the latest available evidence at the time of publishing, they are not intended to overrule professional judgment. Rather, they may be viewed as a relative constraint on individual clinician discretion in a particular clinical circumstance. The independent skill and judgment of the health care provider must always dictate treatment decisions. These nutrition practice guidelines are provided with the express understanding that they do not establish or specify particular standards of care, whether legal, medical or other.

### The Role of Patient Preference

This guideline recognizes the role of patient preferences for possible outcomes of care, when the appropriateness of a clinical intervention involves a substantial element of personal choice or values. With regard to types of evidence that are associated with particular outcomes, Shaughnessy and Slawson (1-3) describe two major classes. Patient-oriented evidence that matters (POEM) deals with outcomes of importance to patients, such as changes in morbidity, mortality or quality of life. Disease-oriented evidence (DOE) deals with surrogate end-points, such as changes in laboratory values or other measures of response. Although the results of DOE sometimes parallel the results of POEM, they do not always correspond.

When possible, ADA recommends using POEM-type evidence rather than DOE. When DOE is the only guidance available, the guideline indicates that key clinical recommendations lack the support of outcomes evidence.

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## References

1. Slawson DC, Shaughnessy AF. Becoming an information master: using POEMs to change practice with confidence. Patient-Oriented Evidence that Matters. *J Fam Pract.* 2000 Jan;49(1):63-7. Erratum in: *J Fam Pract* 2000 Mar;49(3):276.
2. Slawson DC, Shaughnessy AF, Ebell MH, Barry HC. Mastering medical information and the role of POEMs--Patient-Oriented Evidence that Matters. *J Fam Pract.* 1997 Sep;45(3):195-6.
3. Shaughnessy AF, Slawson DC. POEMs: patient-oriented evidence that matters. *Ann Intern Med.* 1997 Apr 15;126(8):667.

- 
- [Critical Illness](#)
  - [Critical Illness \(CI\) Guideline \(2012\)](#)
  - [CI: Introduction \(2012\)](#)

## Critical Illness

### CI: Guideline Methods (2012)

General and Specific Methods for Critical Illness Guideline

Below are links to both the general methods that the Academy of Nutrition and Dietetics has put in place for evidence analysis and creating the guidelines, as well as the specific search methods and criteria for each question.

#### General Methods

[Click here](#) to view a description of the Academy's process of evidence analysis and guideline creation.

#### Methods for Specific Topics

Select Specific Methods from the Introduction section on the left to view descriptions of search criteria and findings for each topic covered in this guideline.

History of the Development of This Guideline

This guideline is the second edition of the Academy's Critical Illness Evidence-Based Nutrition Practice Guideline.

---

- [Critical Illness](#)
- [Critical Illness \(CI\) Guideline \(2012\)](#)
- [CI: Introduction \(2012\)](#)

## Critical Illness

### CI: Specific Methods (2012)

Each evidence analysis topic has a link to supporting evidence, where the **Search Plan and Results** can be found. Here, you can view when the search plan was performed, inclusion and exclusion criteria, search terms, databases that were searched and the excluded articles.

Below are a list of the recommendations and the related evidence analysis questions, with the link to each search plan.

#### Assessment

##### Nutrition Assessment/Reassessment

None.

##### Energy Assessment

[CI: Determination of Resting Metabolic Rate Search Plan and Results](#)

#### Diagnosis

None.

#### Intervention

##### Nutrition Prescription

None.

##### Enteral vs. Parenteral Nutrition

[CI: Enteral vs. Parenteral Nutrition Search Plan and Results](#)

##### Initiation of Feeding

[CI: Initiation of Enteral Nutrition Search Plan and Results](#)

##### Feeding Tube Site

[CI: Gastric vs. Small Bowel Feeding Tube Placement Search Plan and Results](#)

##### Blue Dye Use

[CI: Blue Dye Use Search Plan and Results](#)

#### Optimizing Enteral Nutrition Delivery

[CI: Optimizing Enteral Nutrition Delivery Search Plan and Results](#)

#### Immune-Modulating Formulas

[CI: Immune-Modulating Enteral Nutrition Search Plan and Results](#)

#### Fiber and Enteral Nutrition

[CI: Enteral Nutrition and Fiber Search Plan and Results](#)

#### Supplemental Glutamine

[CI: Supplemental Enteral Glutamine Search Plan and Results](#)

[CI: Supplemental Intravenous Glutamine Search Plan and Results](#)

#### Hypocaloric, High Protein Feeding Regimen

[CI: Hypocaloric, High Protein Feeding Regimen Search Plan and Results](#)

#### Blood Glucose Control

[CI: Blood Glucose Control Search Plan and Results](#)

#### Coordination of Care

None.

#### Monitoring and Evaluation

None.

- [Critical Illness](#)
- [Critical Illness \(CI\) Guideline \(2012\)](#)
- [CI: Introduction \(2012\)](#)

## Critical Illness

### CI: Implementation of the Guideline (2012)

#### Implementation of the Guideline

The publication of this guideline is an integral part of the plans for getting the Academy of Nutrition and Dietetics evidence-based recommendations on critical illness to all dietetics practitioners engaged in, teaching about or researching critical illness as quickly as possible. National implementation workshops at various sites around the country and during the Academy Food Nutrition Conference Expo (FNCE) are planned. Additionally, there are recommended dissemination and adoption strategies for local use of the Academy Critical Illness Evidence-Based Nutrition Practice Guideline.

The guideline development team recommended multi-faceted strategies to disseminate the guideline and encourage its implementation. Management support and learning through social influence are likely to be effective in implementing guidelines in dietetic practice. However, additional interventions may be needed to achieve real change in practice routines.

Implementation of the Critical Illness Guideline will be achieved by announcement at professional events, presentations and training. Some strategies include:

- *National and local events:* State dietetic association meetings and media coverage will help launch the guideline
- *Local feedback adaptation:* Presentation by members of the work group at peer review meetings and opportunities for CEUs for courses completed
- *Education initiatives:* The guideline and supplementary resources will be freely available for use in the education and training of dietetic interns and students in approved Accreditation Council for Education in Nutrition and Dietetics (ACEND) programs
- *Champions:* Local champions will be identified and expert members of the guideline team will prepare articles for publications. Resources will be provided that include PowerPoint presentations, full guidelines and pre-prepared case studies
- *Practical tools:* Some of the tools that will be developed to help implement the guideline include specially designed resources such as clinical algorithms, a toolkit, and a slide presentation.

Specific distribution strategies include:

- *Publication in full:* The guideline will be available electronically at the Academy Evidence Analysis Library and will be announced to all the dietetic practice groups. The Academy Evidence Analysis Library will also provide downloadable supporting information.

- 
- [Critical Illness](#)
  - [Critical Illness \(CI\) Guideline \(2012\)](#)
  - [CI: Introduction \(2012\)](#)

## Critical Illness

### CI: Benefits and Risks/Harms of Implementation (2012)

#### Benefits and Risks/Harms of Implementing the Recommendations

Safety issues should be considered for each form of treatment recommended. A description of the general benefits and risk associated with the implementation of this guideline must be addressed.

To view more information, select the link to the topic listed after each potential benefit/harm.

- A priority aim and benefit of implementing this guideline is to increase the percentage of individuals who are appropriately nourished while in the intensive care unit (ICU), leading to an early ICU discharge, with fewer infectious complications and avoidance of aspiration pneumonia ([CI: Enteral vs. Parenteral Nutrition](#))
- [Enteral nutrition](#) (EN) begun within 24 to 48 hours of injury or admission to the ICU is associated with fewer infectious complications ([CI: Initiation of Enteral Nutrition](#))
- Feeding tubes placed in the small bowel are associated with reduced ventilator-associated pneumonia (VAP) ([CI: Gastric vs. Small Bowel Feeding Tube Placement](#))
- Use of a promotility agent is associated with lower [gastric residual volumes](#) (GRV) ([CI: Optimizing Enteral Nutrition Delivery](#))
- Positioning the head of the patient's bed at 30 to 45 degrees reduces the incidence of aspiration pneumonia and reflux of gastric contents ([CI: Optimizing Enteral Nutrition Delivery](#))
- Intake of EN is greater if an isolated [GRV](#) of 500 ml is accepted in the absence of other signs of intolerance ([CI: Optimizing Enteral Nutrition Delivery](#))
- Glycemic control (140 mg/dL to 180mg/dL) is associated with reduced time on the ventilator for medical ICU patients ([CI: Blood Glucose Control](#))
- Actual delivery of greater than 60% of EN goal is associated with fewer infectious complications in [critically ill adult](#) patients. ([CI: Enteral Nutrition Energy Delivery](#))
- Compared with [parenteral nutrition](#) (PN), EN results in fewer infectious complications, septic morbidity and a lower cost of medical care ([CI: Enteral vs. Parenteral Nutrition](#))
- Measured [resting metabolic rate](#) (RMR), when used as a feeding strategy, provides information to minimize the chances of overfeeding if applied to caloric delivery ([CI: Determination of Resting Metabolic Rate](#))
- Providing [obese](#) ICU patients with hypocaloric, high [protein](#) feeding [ $<20\text{kcal per kg adjusted body weight}$  (ABW) and 2g protein per kg ideal body weight (IBW)] may promote shorter ICU stays, but may not reduce hospital length of stay (LOS) ([CI: Hypocaloric Feeding Regimen](#))
- Glutamine (GLN)-supplemented PN reduces infectious complications in adult critically ill patients ([CI: Supplemental Intravenous Glutamine](#))
- Addition of guar gum to enteral formula may reduce diarrhea in adult critically ill patients ([CI: Enteral Nutrition and Fiber](#))
- For ICU patients without acute respiratory distress syndrome (ARDS), acute lung injury or severe sepsis, [immune-modulating enteral formulas](#) containing some combination of arginine, glutamine, nucleotides, antioxidants and fish oil have shown benefits in reducing infectious complications and LOS ([CI: Immune-Modulating Enteral Nutrition](#)).

Factors to consider when exploring treatment options include:

- Patients admitted to the ICU should be fluid-resuscitated and hemodynamically stable before [early EN](#) is attempted ([CI: Initiation of Enteral Nutrition](#))
  - The use of [immune-modulating EN](#) in severely ill patients may be associated with increased mortality ([CI: Immune-Modulating Enteral Nutrition](#))
  - [Blue dye](#), in excessive doses or used in patients with increased gut permeability, may increase mortality and the risks of the use of blue dye in EN outweigh the benefits. Use of blue dye in EN should be abandoned ([CI: Blue Dye Use](#))
  - Serum glucose levels over 180mg per dL are associated with increased mortality in critically ill patients ([CI: Blood Glucose Control](#))
  - Use caution in fluid-restricted patients receiving supplemental IV glutamine outside the primary PN solution. A commercially available IV glutamine solution with a concentration of 2.5% is currently available; therefore an increased volume of fluid is required to provide effective dosing (McClave et al, 2009; and Vanek et al, 2011) ([CI: Supplemental Glutamine](#))
  - Chronic use of prokinetic agents may have adverse effects ([CI: Optimizing Enteral Nutrition Delivery](#))
  - Long-term use of 45-degree head of bed elevation may be associated with increased pressure over the ischial tuberosities and may expose the patient to greater shearing forces due to gravity-related sliding in the bed (Wipke-Tevis et al, 2004) ([CI: Optimizing Enteral Nutrition Delivery](#))
  - Benefits of early initiation of EN may be lost if there is a delay ([CI: Optimizing Enteral Nutrition Delivery](#))
  - There is potential for reduced EN delivery if formula is repeatedly stopped or held ([CI: Optimizing Enteral Nutrition Delivery](#)).
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