# Canadian Clinical Practice Guidelines 2013
## Summary of Revisions to the Recommendations

Critical Care Nutrition

| # | Topic | Number of new RCTs | Recommendation compared to 2009 | | | | 2013 Recommendation | 2009 Recommendation |
|---|---|---|---|---|---|---|---|---|
| | | | same | upgraded | downgraded | n/a (new section) | | |
| 1. | **The Use of Enteral Nutrition vs. Parenteral Nutrition** | 2 | √ | | | | Based on one level 1 and 13 level 2 studies, when considering nutrition support for critically ill patients, we strongly recommend the use of enteral nutrition over parenteral nutrition. | Based on one level 1 and 12 level 2 studies, when considering nutrition support for critically ill patients, we strongly recommend the use of enteral nutrition over parenteral nutrition. |
| 2. | **Early vs. delayed nutrient intake** | 2 | √ | | | | Based on 16 level 2 studies, we recommend early enteral nutrition (within 24-48 hours following admission to ICU) in critically ill patients. | Based on 14 level 2 studies, we recommend early enteral nutrition (within 24-48 hours following admission to ICU) in critically ill patients. |
| 3.1 | **Nutritional Prescription: Use of Indirect Calorimetry vs. Predictive Equations** | 1 | √ | | | | There are insufficient data to make a recommendation on the use of indirect calorimetry vs. predictive equations for determining energy needs for nutrition or to guide when nutrition is to be supplemented in critically ill patients. | There are insufficient data to make a recommendation on the use of indirect calorimetry vs. predictive equations for determining energy needs for enteral nutrition in critically ill patients. |
| 3.2 | **Nutritional Prescription of Enteral Nutrition: Achieving Target Dose of Enteral Nutrition** | 0 | √ | | | | No changes from 2009 | Based on 2 level 2 studies and 2 cluster randomized controlled trials , when starting enteral nutrition in critically ill patients, strategies to optimize delivery of nutrients (starting at target rate, higher threshold of gastric residual volumes, use of prokinetics and small bowel feedings) should be considered. |

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| **3.3a** | **Intentional Underfeeding: Trophic Feeds vs Full Feeds** | **2** | | | | √ | Based on 2 level 1 studies, in patients with Acute Lung Injury, an initial strategy of trophic feeds for 5 days should not be considered | New Section in 2013 |
| **3.3b** | **Intentional Underfeeding: Hypocaloric Enteral Nutrition** | **1** | | | | √ | There are insufficient data to make a recommendation on the use of hypocaloric enteral nutrition in critically ill patients. | New Section in 2013 |
| **4.1a.** | **Composition of EN: Diets Supplemented with Arginine and Select Other Nutrients*** | **2** | √ | | | | Based on 4 level 1 studies and 22 level 2 studies, we do not recommend diets supplemented with arginine and other select nutrients be used for critically ill patients. | Based on 4 level 1 studies and 20 level 2 studies, we recommend that diets supplemented with arginine and other select nutrients not be used for critically ill patients. |
| **4.1b(i)** | **Composition of EN: Fish Oils, Borage Oils and Antioxidants** | **4** | | | √ | | Based on 2 level 1 studies and 5 level 2 studies, the use of an enteral formula with fish oils, borage oils and antioxidants in patients with Acute Lung Injury (ALI) and Acute Respiratory Distress Syndrome (ARDS) should be considered. | Based on 1 level 1 study and 4 level 2 studies, we recommend the use of an enteral formula with fish oils, borage oils and antioxidants in patients with Acute Lung Injury (ALI) and acute respiratory distress syndrome (ARDS). |
| **4.1b(ii)** | **Composition of EN: Fish oil supplementation** | **1** | | | | √ | There are insufficient data to make a recommendation on the supplementation of fish oils alone in critically ill patients | New Section in 2013 |

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| **4.1c** | **Composition of EN: Immune Enhancing Diets: Glutamine** | **0** | | | √ | | No changes from 2009 but a caution against the use of any glutamine in patients with shock and MOF was added given the possibility of harm as demonstrated by the results of the REDOXS study of combined enteral and parenteral glutamine. | Based on 2 level 1 and 7 level 2 studies, enteral glutamine should be considered in burn and trauma patients. There are insufficient data to support the routine use of enteral glutamine in other critically ill patients. |
| **4.1d** | **Composition of EN: Immune Enhancing Diets: Ornithine Ketoglutarate (OKG)** | **0** | √ | | | | No changes from 2009 | There are insufficient data to make a recommendation regarding the use of ornithine ketoglutarate for burn patients and other critically ill patients. |
| **4.2.a** | **Composition of EN: (Carbohydrate/fat): High fat/low CHO** | **0** | √ | | | | No changes from 2009 | There are insufficient data to recommend high fat/low CHO diets for critically ill patients. |
| **4.2.b** | **Composition of EN: (Carbohydrate/fat): Low fat/high CHO** | **0** | √ | | | | No changes from 2009 | There are insufficient data to recommend low fat/high CHO diets for critically ill patients. |
| **4.2.c** | **Composition of EN: High Protein vs. Low Protein** | **1** | √ | | | | No changes from 2009 | There are insufficient data to make a recommendation regarding the use of high protein diets for head injured patients and other critically ill patients. |

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| **4.3** | **Strategies for optimizing and minimizing risks of EN: Protein vs. Peptides** | **1** | | | √ | | Based on 5 level 2 studies, when initiating enteral feeds, the use of whole protein formulas (polymeric) should be considered. | Based on 4 level 2 studies, when initiating enteral feeds, we recommend the use of whole protein formulas (polymeric). |
| **4.4** | **Composition of Enteral Nutrition: pH** | **0** | √ | | | | No changes from 2009 | There are insufficient data to make a recommendation regarding the use of low pH feeds in critically ill patients. |
| **4.5** | **Composition of Enteral Nutrition: Strategies for optimizing EN and minimizing risks of EN: Fibre** | **2** | √ | | | | There are insufficient data to support the routine use of fibre (soluble or insoluble) in enteral feeding formulas in critically ill patients. | There are insufficient data to support the routine use of fibre (pectin or soy polysaccharides) in enteral feeding formulas in critically ill patients. |
| **5.1** | **Strategies to Optimize Delivery and Minimize Risks of EN: Feeding Protocols** | **0** | √ | | | | No changes from 2009 | Based on 1 level 2 study and 2 cluster randomized controlled trials, an evidence based feeding protocol that incorporates prokinetics at initiation and a higher gastric residual volume (250 mls) and the use of post pyloric feeding tubes, should be considered as a strategy to optimize delivery of enteral nutrition in critically ill adult patients. |

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| 5.2 | **Strategies to Optimize Delivery and Minimize Risks of EN: Motility Agents** | 0 | √ | | | | No changes from 2009 | Based on 1 level 1 study and 5 level 2 studies, in critically ill patients who experience feed intolerance (high gastric residuals, emesis), we recommend the use of a promotility agent. Given the safety concerns associated with erythromycin, the recommendation is made for metoclopramide. There are insufficient data to make a recommendation about the use of combined use of metoclopramide and erythromycin. |

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| **5.3** | **Strategies to Optimize Delivery and Minimize Risks of EN: Small Bowel Feeding vs. Gastric** | **4** | √ | | | | No changes from 2009 | Based on 11 level 2 studies, small bowel feeding compared to gastric feeding may be associated with a reduction in pneumonia in critically ill patients. In units where small bowel access is feasible, we recommend the routine use of small bowel feedings. In units where obtaining access involves more logistical difficulties, small bowel feedings should be considered for patients at high risk for intolerance to EN (on inotropes, continuous infusion of sedatives, or paralytic agents, or patients with high nasogastric drainage) or at high risk for regurgitation and aspiration (nursed in supine position). Finally, where obtaining small bowel access is not feasible (no access to fluroscopy or endoscopy and blind techniques not reliable), small bowel feedings should be considered for those select patients that repeatedly demonstrate high gastric residuals and are not tolerating adequate amounts of EN intragastrically. |

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| **5.4** | **Strategies to optimize delivery and minimize risks of Enteral Nutrition: Body position** | **0** | √ | | | | No changes from 2009 | Based on 1 level 1 and 1 level 2 study, we recommend that critically ill patients receiving enteral nutrition have the head of the bed elevated to 45 degrees. Where this is not possible, attempts to raise the head of the bed as much as possible should be considered. |
| **5.5** | **Strategies to Optimize the Delivery of EN: Threshold of Gastric Residual** | **2** | | | | √ | There are insufficient data to make a recommendation for specific gastric residual volume threshold. Based on 1 level 2 study, a gastric residual volume of either 250 or 500 mLs (or somewhere in between) is acceptable as a strategy to optimize delivery of enteral nutrition in critically ill patients. | New Section in 2013 |
| **5.6** | **Strategies to Optimize the Delivery of EN: Discarding Gastric Residual** | **1** | | | | √ | There are insufficient data to make a recommendation to return gastric residual volumes up to a certain threshold in critically ill adult patients. Based on 1 level 2 study, re-feeding GRVs up to a maximum of 250 mls or discarding GRVs may be acceptable. | New Section in 2013 |
| **6.1** | **Enteral Nutrition (Other): Closed vs. Open System** | **0** | √ | | | | No changes from 2009 | There are insufficient data to make a recommendation on the administration of EN via closed vs. open system in the critically ill. |

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| **6.2** | **Enteral Nutrition (Other): Probiotics** | **12** | | √ | | | Based on 3 level 1 and 20 level 2 studies, the use of probiotics should be considered in critically ill patients. | There are insufficient data to make a recommendation on the use of Prebiotics/Probiotics/Synbiotics in critically ill patients. |
| **6.3** | **Enteral Nutrition (Other): Continuous vs. Other Methods of Administration** | **0** | √ | | | | No changes from 2009 | There are insufficient data to make a recommendation on enteral feeds given continuously vs. other methods of administration in critically ill patients |
| **6.4** | **Enteral Nutrition (Other): Gastrostomy vs. Nasogastric Feeding** | **0** | √ | | | | No changes from 2009 | There are insufficient data to make a recommendation on gastrostomy feeding vs. nasogastric feeding in the critically ill. |
| **6.5** | **Enteral Nutrition: Other Formulas: ß Hydroxyl Methyl Butyrate (HMB)** | **1** | | | | √ | There are insufficient data to make a recommendation of ß Hydroxyl Methyl Butyrate (HMB) supplementation in critically ill patients. | New Section in 2013 |

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| **7.1** | **Combination Parenteral Nutrition and Enteral Nutrition** | **3** | √ | | | | Based on 1 level 1 study and 7 level 2 studies, for critically ill patients starting on enteral nutrition we recommend that parenteral nutrition not be started at the same time as enteral nutrition. In the patient who is not tolerating adequate enteral nutrition, there are insufficient data to put forward a recommendation about when parenteral nutrition should be initiated. Practitioners will have to weigh the safety and benefits of initiating PN in patients not tolerating EN on an individual case-by-case basis. We recommend that PN not be started in critically ill patients until all strategies to maximize EN delivery (such as small bowel feeding tubes, motility agents) have been attempted. | Based on 5 level 2 studies, for critically ill patients starting on enteral nutrition we recommend that parenteral nutrition not be started at the same time as enteral nutrition. In the patient who is not tolerating adequate enteral nutrition, there are insufficient data to put forward a recommendation about when parenteral nutrition should be initiated. Practitioners will have to weigh the safety and benefits of initiating PN in patients not tolerating EN on an individual case-by-case basis. We recommend that PN not be started in critically ill patients until all strategies to maximize EN delivery (such as small bowel feeding tubes, motility agents) have been attempted. |

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| 7.2. | **Early vs. Delayed Supplemental Parenteral Nutrition** | 1 | | | | √ | We **strongly recommend** that early supplemental PN and high IV glucose **not be used** in unselected critically ill patients (i.e. low risk patients with short stay in ICU). In the patient who is not tolerating adequate enteral nutrition, there are **insufficient data** to put forward a recommendation about when PN should be initiated. Practitioners will have to weigh the safety and benefits of initiating PN in patients not tolerating EN on an individual case-by-case basis. | New Section in 2013 |
| 8.0 | **Parenteral Nutrition vs. Standard care** | 0 | √ | | | | No changes from 2009 | Based on **5 level 2 studies**, in critically ill patients with an intact gastrointestinal tract, we **recommend** that parenteral nutrition **not be used** routinely |
| 9.1 | **Composition of Parenteral Nutrition: Branched Chain Amino Acids (BCAA)** | 1 | √ | | | | In patients receiving parenteral nutrition or enteral nutrition, there are **insufficient data** to make a recommendation regarding the use of intravenous supplementation with higher amounts of branched chain amino acids in critically ill patients. | In patients receiving parenteral nutrition, there are **insufficient data** to make a recommendation regarding the use of branched chain amino acids in critically ill patients. |

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| 9.2 | **Composition of Parenteral Nutrition: Type of lipids** | 4 | | √ | | | When parenteral nutrition with intravenous lipids is indicated, IV lipids that reduce the load of omega-6 fatty acids/soybean oil emulsions **should be considered**. However, there are **insufficient data** to make a recommendation on the type of lipids to be used that reduce the omega-6 fatty acid/soybean oil load in critically ill patients receiving parenteral nutrition. | There are **insufficient data** to make a recommendation on the type of lipids to be used in critically ill patients receiving parenteral nutrition. |
| 9.3 | **Composition of Parenteral Nutrition: Zinc (either alone or in combination with other antioxidants)** | 0 | √ | | | | No changes from 2009 | There are **insufficient data** to make a recommendation regarding IV/PN zinc supplementation in critically ill patients. |
| 9.4.a. | **Composition of Parenteral Nutrition: Glutamine Supplementation** | 11 | | | √ | | Based on 9 **level 1 studies and 19 level 2 studies**, when parenteral nutrition is prescribed to critically ill patients, parenteral supplementation with glutamine **should be considered**. However, we **strongly recommend** that glutamine NOT be used in critically ill patients with shock and multi-organ failure (refer to section 9.4 b). There are **insufficient data** to generate recommendations for intravenous glutamine in critically ill patients receiving EN. | Based on 4 **level 1 studies and 13 level 2 studies**, when parenteral nutrition is prescribed to critically ill patients, parenteral supplementation with glutamine, where available, is **strongly recommended**. There are **insufficient data** to generate recommendations for intravenous glutamine in critically ill patients receiving enteral nutrition |

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| **9.4.b.** | **Combined Parenteral and Enteral Glutamine Supplementation** | **1** | | | | √ | Based on one level 1 study, we strongly recommend that high dose combined parenteral and enteral glutamine supplementation NOT be used in critically ill patients with shock and multi-organ failure. | New Section in 2013 |
| **10.1** | **Strategies to Optimize Parenteral Nutrition and Minimize Risks: Dose of PN** | **0** | √ | | | | No changes from 2009 | Based on 4 level 2 studies, in critically ill patients who are not malnourished, are tolerating some EN, or when parenteral nutrition is indicated for short term use (< 10 days), low dose parenteral nutrition should be considered. There are insufficient data to make recommendations about the use of low dose parenteral nutrition in the following patients: those requiring PN for long term (> 10 days); obese critically ill patients and malnourished critically ill patients. Practitioners will have to weigh the safety and benefits of low dose PN on an individual case-by-case basis in these latter patient populations. |

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| **10.2** | **Strategies to Optimize Parenteral Nutrition and Minimize Risks: Use of lipids** | **0** | √ | | | | No changes from 2009 | Based on 2 level 2 studies, in critically ill patients who are not malnourished, are tolerating some EN, or when parenteral nutrition is indicated for short term use (< 10 days), withholding lipids high in soybean oil should be considered. There are insufficient data to make a recommendation about withholding lipids high in soybean oil in critically ill patients who are malnourished or those requiring PN for long term (> 10 days). Practitioners will have to weigh the safety and benefits of withholding lipids high in soybean oil on an individual case-by-case basis in these latter patient populations. |
| **10.3** | **Strategies to optimize Parenteral Nutrition: Mode of lipid delivery** | **0** | √ | | | | No changes from 2009 | There are insufficient data to make a recommendation on the use of lipids in total nutrient admixtures (TNA) vs. piggyback in critically ill patients. |

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| **10.4.a** | **Optimal glucose control: Insulin therapy** | **3** | √ | | | | Based on 26 level 2 studies, we recommend that hyperglycemia (blood sugars > 10 mmol/L) be avoided in all critically ill patients and we recommend a blood glucose target of around 8.0 mmol/L (or 7-9 mmol/L), rather than a more stringent target range (4.4 to 6.1 mmol/L) or a more liberal target range (10 to 11.1 mmol/L). | We recommend that hyperglycemia (blood sugars > 10 mmol/L) be avoided in all critically ill patients. Based on the NICE-SUGAR study and a recent meta-analysis, we recommend a blood glucose target of around 8.0 mmol/L (or 7-9 mmol/L), rather than a more stringent target range (4.4 to 6.1 mmol/L) or a more liberal target range (10 to 11.1 mmol/L). |
| **10.4.b.** | **Optimal glucose control: Carbohydrate restricted formula + insulin therapy** | **1** | | | | √ | There are insufficient data to recommend low carbohydrate diets in conjunction with insulin therapy for critically ill patients. | New Section in 2013 |
| **11.1** | **Supplemental Antioxidant Nutrients: Combined Vitamins and Trace Elements** | **8** | √ | | | | Based on 7 level 1 and 16 level 2 studies, the use of supplemental combined vitamins and trace elements should be considered in critically ill patients. | Based on 3 level 1 and 13 level 2 studies, the use of supplemental combined vitamins and trace elements should be considered in critically ill patients. |
| **11.2** | **Supplemental Antioxidant Nutrients: Parenteral Selenium** | **7** | | √ | | | The use IV/PN selenium supplementation, alone or in combination with other antioxidants, should be considered in critically ill patients. | There are insufficient data to make a recommendation regarding IV/PN selenium supplementation, alone or in combination with other antioxidants, in critically ill patients. |

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| **12.0** | **Vitamin D** | **1** | | | | √ | There are **insufficient data** to make a recommendation for the use of Vitamin D in critically ill patients. | New Section in 2013 |