Additional Material: Taxonomy for linking indentified barriers to change strategies

Purpose: There is growing evidence that tailoring guideline implementation efforts to identified barriers is more effective than adopting a non-tailored approach[1]. However, once a barriers assessment has been completed there is little guidance available to inform the selection of the most appropriate strategies to overcome the identified barriers. This taxonomy was developed to assist critical care practitioners in this selection process. The first column lists the type of barrier that may potentially hinder the provision of nutrition in the ICU as highlighted in a previously developed framework for understanding barriers to guideline adherence in the ICU[2]. The second column lists potential actions that may be taken to overcome the specific barrier. These are offered as examples of potential actions and it is advised that local key stakeholders consider which actions may be most feasible and impactful within their local setting. The third column lists tools and resources that may be utilized when implementing the action. Templates for several of these enabling tools and resources have been developed and are highlighted in yellow in the taxonomy. They are available to download from the Resource Centre Toolkit on our website www.criticalcarenutrition.com.

Barrier	Potential Action	Enabling Tools and Resources
Barrier Type: Guideline Recommendations		
Inadequate evidence supporting the recommendations	Present and review current evidence supporting the recommendations to individuals group where this is a barrier. Based on review process Guideline Implementation Team to adapt recommendation to local context. Ongoing review of literature so that new evidence can be incorporated into practice.	Binder of original journal articles Summaries of evidence / metaanalysis Powerpoint highlighting evidence / results of metaanalyses and current recommendations Web-based repository of key journal articles
Guidelines are not readily accessible	Ensure copy of the guidelines are available to all members of the ICU Team	Place copy of guidelines in nutrition binder in the ICU Poster and screen savers or computer desktop background advertising weblink to criticalcarenutriiton.com Post copy of the guidelines on the intranet

		Pocket cards 1-page summary for bed-side chart
Language of the guideline recommendations are not easy to understand	Summarize/simplify the published guidelines	Feeding protocol / algorithm 1-page summary Pocket cards
Barrier Type: Guideline Implementation		
Not enough time dedicated to nutrition education	Incorporate a nutrition module in orientation training of new staff Ensure nutrition is the focus of rounds /group training at least once a year Informal education through monthly 'bed-side' huddle with dietitian or dietitian presence of rounds	Discipline specific powerpoint on role in provision of enteral nutrition Online tutorials and case scenario based learning modules
No feeding protocol or current protocol updated	Implement new or updated feeding protocol	Evidence-based feeding protocol/pre-printed orders Powerpoint providing education on the rationale for each step in the protocol. Laminated bed-side algorithms Poster and screen savers or computer desktop background advertising weblink to criticalcarenutriiton.com
Barrier Type: ICU Characteristics		
Lack of teamwork	Measure teamwork and organizational culture Build collaboration	Questionnaire for measuring organizational culture (e.g. Shortell Organizational culture questionnaire[3])

	Ensure representatives of all disciplines are present on daily rounds Multidisciplinary teamwork committee Problem-solving workshop or social activity to build teamwork	Teamwork activities Questionnaire to identify nutrition champion / opinion leader
Lack of joint-decision making	Ensure representatives of all disciplines are present on daily rounds Workshop on teamwork and conflict management	Questionnaire for measuring organizational culture (e.g. Shortell Organizational culture questionnaire[3])
Poor communication	Communication skills training Ensure representatives of all disciplines are present on daily rounds Monthly newsletter	Newsletter
Lack of agreement on nutrition plan of care	Workshop on teamwork, communication skills, and conflict management Adapt guideline recommendations to local context Enforcement of specific nutrition practices through legislation based on guideline recommendations	
No culture of best practice	Present and review current evidence and impact on outcomes Audit practice and benchmark performance compared to similar ICUs.	Audit and feeback (e.g. International Nutrition Survey) and guidelines on how to optimally use the benchmarked report (small group problem sessions)
Lack of management support	Measure leadership	Questionnaire for measuring organizational culture (e.g. Shortell Organizational culture

	Economic analysis	questionnaire[3]) Briefing notes highlighting rationale for requesting support (e.g. need for more dietitians time, need for resources for quality improvement activities)
Not enough nursing staff	Increase nursing staff Implement protocols to increase efficiency of provision of nutrition Nursing mentorship program, with a nurse champion identified.	Protocols/decision-aids Briefing note delineating why more nurses or nurse training is required Nurse directed educational intervention on use of protocols Guidance on how to identify and train a nurse champion
Not enough dietitian time / coverage	Implement protocols/decision support aids to be used in the dietitians absence Increase dietitian time	Protocols/decision-aids Briefing note delineating why more dietitian time needed
Enteral formula not available	Increase storage of enteral formulas in the unit	Par level stock tracking sheet
Not enough feeding pumps	Increase number of feeding pumps in the unit	Briefing note to provide rationale for the provision of more feeding pumps
Barrier Type: Provider Behaviour		
Delay in physicians ordering EN	Targeted physician education Implement pre-printed orders Audit time to initiation of EN and reasons for delay and feedback to physicians	Pre-printed orders Powerpoint on the merits and practicalities of early EN Nutrition Information Byte (NIBBLE) on early EN and feeding the hemodynamically unstable patient

		Pack of key journal articles Smartphone/ipod apps
Waiting for dietitian assessment	Review referral process Specify that the feeding protocol initiate a dietitian consult automatically. Implement nutrition protocols/decision support aids to follow while waiting for dietitians assessment	Protocols and decision aids
Non-ICU physicians requesting patients not be fed	Targeted education of non-ICU physicians Development of agreed policy/procedures /goals for feeding in the ICU between non-ICU and ICU physicians Audit time to initiation of EN and reasons for delay and feedback to physicians Reporting of caloric debt/nutrition adequacy on daily rounds	Powerpoint on why nutrition is important, highlighting evidence and strategies on how to maximize the benefits and minimize the risks Nutrition Information Byte (NIBBLE) on feeding the surgical patients / hemodymatically unstable patient / GI patient with anastamosis Nutrition adequacy calculator spreadsheet
Nurses failing to progress feeds as prescribed	Target nurse education Implementation of feeding algorithm Reporting of caloric debt/nutrition adequacy on daily rounds	Powerpoint Feeding protocols Laminated bed-side algorithms Nutrition adequacy calculator Posters Nutrition Information Byte (NIBBLE) on caloric debt

		Bathrooms notices Newsletters
Nutrition not deemed important / other priorities of care	Increase awareness of why nutrition important Implement protocols to automate nutrition regardless of priorities Reporting of caloric debt/nutrition adequacy on daily rounds	Screening questionnaire to assess priority of providing nutrition Powerpoint on why nutrition is important Feeding protocols Nutrition adequacy calculator Nutrition Information Byte (NIBBLE) on caloric debt Bathroom notices Questionnaire for identifying nutrition champion / opinion leader
Lack of outcome expectancy if patient fed	Increase awareness of why nutrition important	Powerpoint on why nutrition is important Guidelines for identifying and training nutrition champions
Lack of personal responsibility for nutrition	Clarify roles and responsibilities of each team member Increase awareness of why nutrition important Participate in annual audits and feedback and with the bench marked report, engage team in small group discussion of strategies to improve on weaknesses (who does what to whom by when).	Powerpoint on why nutrition is important International Nutrition Survey audits and benchmarked reports Guidelines for conducting effective small group problem sessions.

Lack of familiarity with current nutrition guidelines	Present and review current guideline recommendations Ensure copy of guidelines is readily available to all ICU Team members	Screening questionnaire to assess nutrition knowledge Nutrition Information Byte (NIBBLE) Powerpoint on current guideline recommendations Posters Pocketcards Screensaver Bathroom notices Smartphone/ipod apps
Barrier Type: Patient Specific Factors		
Feeding being held too far in advance of procedures	Implement protocol for stopping feeds prior to procedures followed by educational intervention Algorithm for making up feeding volume due to interruptions	Protocol for interruptions Algorithm for making up feeding volume due to interruptions
No feeding tube in place	Ensure supply of feeding tubes at the bed-side Train re routine insertion on admission Audit this particular practice/problem and feedback success with overcoming this problem.	Plan-Do-Study-Act (PDSA) cycle reporting (time series analysis, posters, etc.)
Delays in initiating motility agents in patients with high gastric residual volumes	Incorporate motility agents in feeding protocol	Feeding protocol

	Allow motility agent to be initiated without MD order Educate team on the merits of early EN and the role of timely administration of EN and motility agents. Review nutrition adequacy on daily rounds	Bed-side feeding checklist Powerpoint on maximizing EN and the role of motility agents. Nutrition Information Byte (NIBBLE) on strategies to optimize EN
Delays in obtaining small bowel access	Incorporate small bowel feeding in feeding protocol Increase training of staff on how to insert small bowel tubes at the bed-side Review nutrition adequacy on daily rounds Make available easy to place, self migrating feeding tubes or other systems designed to facilitate small bowel access..	Feeding protocol Guidelines for instructions for blind placement of small bowel feeding tubes Instructional video Bed-side feeding checklist Nutrition Information Byte (NIBBLE) on strategies to optimize EN

References

1. Baker R, Camosso-Stefinovic J, Gillies C, et al. Tailored interventions to overcome identified barriers to change: effects on professional practice and health care outcomes. *Cochrane Database Syst Rev.* 2010(3):CD005470.
2. Cahill NE, Suurdt J, Ouellette-Kuntz H, Heyland DK. Understanding adherence to guidelines in the intensive care unit: development of a comprehensive framework. *JPEN J Parenter Enteral Nutr.* Nov-Dec 2010;34(6):616-624.
3. Shortell SM, Rousseau DM, Gillies RR, Devers KJ, Simons TL. Organizational assessment in intensive care units (ICUs): construct development, reliability, and validity of the ICU nurse-physician questionnaire. *Med Care.* Aug 1991;29(8):709-726.