ICU Nutrition: Knowledge Translation World Wide

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November 9 – 12, 2013
Sheraton Centre Toronto Hotel
I have received speaker honoraria from the following companies:

- Nestlé Health Science
- Fresenius Kabi
- Baxter
- Abbott
Clinical Evaluation Research Unit
Knowledge Translation

a dynamic and iterative process, includes
✓ Synthesis
✓ Dissemination &
✓ Application of knowledge

✓ improve the health of Canadians
✓ provide more effective health services and
✓ strengthen the healthcare system
Objectives

Review the Knowledge Translation Program

Knowledge Synthesis
Development and update of guidelines

Knowledge Translation
Identifying gaps
Audit and feedback
Creating a culture of Excellence
Assessment of barriers to feeding
Selecting and tailoring intervention
Knowledge Synthesis

Knowledge To Action Model

Since 1980, >300 randomized trials of nutrition interventions

Systematic reviews and meta-analyses of nutrition related topics

Development of Canadian Nutrition Guidelines
Published in 2003 and updated in 2007, 2009

Rigorous development process
- Systematic review of ≈ 300 RCTs reporting clinical outcomes
- Multidisciplinary committee

Dissemination Guidelines Cluster RCT: Jain et al 2005
Happy 10th Anniversary to the Canadian Clinical Practice Guidelines!

We started publishing these guidelines in 2003. Since then, we have engaged in many quality improvement initiatives to narrow the gap between CPGs. Engaging in efforts to update our guidelines is essential. Engaging in opportunities to identify barriers to the adoption of guidelines and targeting. Creating a comprehensive list of quality improvement tools to improve delivery of nutrition. We review and update the guidelines every 5 years. 68 new RCTs since 2009. 45 recommendations for practice. Translated into Spanish soon....

Thank you for helping us keep the Canadian Clinical Practice Guidelines alive!
International audits of nutrition practice
Audits of Current Practice
International Nutrition Surveys

• **Purpose**
  – Illuminate gaps between current practice and guideline recommendations
  – Identify practice areas to target for change

• **History**
  – Started in Canada in 2001

• **Methods**
  – 20 consecutive patients
  – Data abstracted from hospital chart
Recommendations: Based on 8 level 2 studies, we recommend early enteral nutrition (within 24-48 hrs following resuscitation) in critically ill patients.

Early vs Delayed Nutrition Intake
Click here to register for INS 2013!

Register online for INS 2013 now!
Click the button to the left to complete the online registration form. You may wish to use the instructions and paper case report form titled 'Site Registration' to assist you with online registration (found here). After submitting your online registration form, you will receive an email with your login and password for the electronic data capture system, REDCap.

What is the International Nutrition Survey?

To date, there have been three international period prevalence surveys of nutrition therapies in Intensive Care Units (ICUs), with over 150 ICUs participating each year. This ongoing quality improvement (QI) initiative, aims to compare current nutrition practices in ICUs within and across different countries. The aim of the initiative is to illuminate differences, highlight strengths and weaknesses, and hopefully lead to
Participation: INS 2013 preliminary

N = 173 ICUs so far

Canada: 21
USA: 44
Australia & New Zealand: 34
Europe & Africa: 27
Asia: 34
Latin America: 13
Turkey: 8
- UK: 6
- Ireland: 4
- Norway: 4
- Switzerland: 2
- Italy: 1
- Sweden: 1
- South Africa: 1
Japan: 18
- India: 7
- Singapore: 5
- Philippines: 2
- Iran: 1
- Thailand: 1

Colombia: 6
Uruguay: 4
Venezuela: 2
Peru: 1
Norway: 4
Switzerland: 2
Italy: 1
Sweden: 1
South Africa: 1
n =211 ICUs, mean intake 56% prescribed calories

Heyland et al INS 2011 unpublished data
Optimal Amount of Calories for Critically Ill Patients: Depends on how you slice the cake!

Association Between 12-day Caloric Adequacy and 60-day Hospital Mortality

Optimal amount = 80-85%


Percent of caloric prescription received in first 12 ICU days

Prob\[\text{PATIENTED}\]
Failure Rate

% high risk patients who failed to meet minimal quality targets (80% overall energy adequacy)

Heyland et al Unpublished observations
Results of 2011 International Nutrition Survey (INS)
In patients with high gastric residual volumes:

- use of motility agents **58.7%** (site average range: 0-100%)
- use of small bowel feeding **14.7%** (range: 0-100%)
Assess Organizational Culture

- “The way things are around here”
- Defines how decisions regarding feeding are made
- Major influence on CPG adherence
- Define, measure and change culture
- Recognition: “Culture of Excellence”

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Creating a Culture of Clinical Excellence in Critical Care Nutrition: The 2008 “Best of the Best” Award

Daren K. Heyland, MD, FRCPC\textsuperscript{1,2,3}; Richard D. Heyland, MBA\textsuperscript{4}; Naomi E. Cahill, RD, MSc\textsuperscript{2,3}; Rupinder Dhaliwal, RD\textsuperscript{3}; Andrew G. Day, MSc\textsuperscript{3}; Xuran Jiang, MSc\textsuperscript{3}; Siouxzy Morrison, RN, and Andrew R. Davies, MD\textsuperscript{5,6}

Ranked according to adherence to key recommendations to guidelines
Lyn Gillanders, Senior Clinical Dietitian and her ICU colleagues at the Department of Critical Care Medicine, Auckland City Hospital being presented with the Best of the Best Award by the Hospital Medical Director.
Best of the Best 2009

The Team at the Instituto Neurologico de Antioquia, Medellin, Colombia
Best of the Best 2011

The Team at the Alfred Hospital ICU, Melbourne, Australia
Determinants of Top Performance

What site and hospital characteristics are associated with top BOB ranking?

<table>
<thead>
<tr>
<th>Hospital/ICU characteristics**</th>
<th>p values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region</td>
<td></td>
</tr>
<tr>
<td>Australia and New Zealand vs. Canada</td>
<td>0.61</td>
</tr>
<tr>
<td>China vs. Canada</td>
<td>0.008</td>
</tr>
<tr>
<td>Europe and South Africa vs. Canada</td>
<td>0.22</td>
</tr>
<tr>
<td>India vs. Canada</td>
<td>0.08</td>
</tr>
<tr>
<td>Latin America vs. Canada</td>
<td>0.98</td>
</tr>
<tr>
<td>USA vs. Canada</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Hospital size (per 100 beds)</td>
<td>0.78</td>
</tr>
<tr>
<td>ICU structure</td>
<td></td>
</tr>
<tr>
<td>Closed vs. open or other</td>
<td>0.89</td>
</tr>
<tr>
<td>Presence of Dietitian(s)</td>
<td></td>
</tr>
<tr>
<td>Yes vs. No</td>
<td>0.005</td>
</tr>
</tbody>
</table>
Need to assess Local Barriers

Assess Barriers & adapt to local context
Assessing Barriers to Guideline Adherence

Conceptual Framework

Multiple case studies:
- 4 Canadian ICUs
- 28 Key informant interviews
- Qualitative analysis

Jones N et al J Crit Care 2008
Cahill N et al JPEN 2010
Top 5 Ranked Barriers (RNs)

1. In resuscitated, hemodynamically stable patients, other aspects of patient care still take priority over nutrition

2. No or not enough feeding pumps on the unit

3. Enteral formula not available on the unit

4. Delays and difficulties in obtaining small bowel access in patients not tolerating enteral nutrition (i.e. high gastric residual volumes)

5. Delay in physicians ordering the initiation of EN

Cahill N et al *J Crit Care* 2012
Enlightened Protein-Energy Provision via the Enteral Route Feeding Protocol in Critically Ill Patients: Results of a Cluster Randomized Trial

Daren K. Heyland, MD, MSc1,2,3; Lauren Murch, MSc; Naomi Cahill, RD, PhD1,2; Michele McCall, RD, MSc; John Muscedere, MD1,3; Henry T. Stelfox, MD, PhD5,6,7; Tricia Bray, RN, MN8; Teddie Tanguay, RN, NP, MN9; Xuran Jiang, MSc1; Andrew G. Day, MSc1

Hypothesis

An enhanced feeding protocol combined with a nurse-directed nutrition educational intervention will be safe, acceptable, and effectively increase protein and energy delivery to critically ill patients

Cluster RCT
18 sites in Canada, US (lowest performing sites)
Pre and post protocol (6-9 months on protocol) or standard care
N = 1089 patients
A Major Paradigm Shift in How we Feed Enterally

- **Stable patients:** immediately at goal rate, not at 25 ml/hr
- **Hypotensive patients:** EN start at 10 ml/hr
- **NPO:** indicate reason and re-assess
- 24 hour **volume based EN feeding** rather than an hourly rate
- **RN** to increase the hourly rate to make up the 24 hour volume.
- **Semi elemental solution**, progress to polymeric
- **Higher GRV threshold** (300 ml or more)
- **Motility agents** started immediately
- **Protein supplements** (14 gm BID)
Change in % calories received
Change in % protein intake
Creating a Collaborative

www.criticalcarenutrition.com

28 ICUs interested
- Canadian
- USA
- Turkey
- Chile
- South Africa

**What is it?** The PEP uP Nutrition Collaborative is designed to foster a network of clinicians committed to the optimal delivery of enteral nutrition therapy in the ICU. The aim of this collaborative is to provide practical tools and strategies to improve the delivery of enteral nutrition, including a volume-based feeding protocol (The PEP uP Protocol), along with additional resources and education of the multidisciplinary team. This initiative will provide dietitians, nurses, and physicians the opportunity to improve current nutrition practices, resulting in better patient outcomes. This initiative will also enable these practitioners to further their role as nutrition educators in the ICU.

**When:** Ongoing. Started in the fall of 2012.

**Can I still get involved?** Yes! If you are interested in participating, and if you are an ICU with at least 8 patients, visit our site to learn more.
Education and Awareness Tools

PEP uP Pocket Guide

PEP uP Poster

**PEP uP**
Increased protein and energy delivery

**What?**
Enhanced Protein Energy Provision via the Enteral Route in Critically Ill Patients

**Why?**
Increase protein and calorie delivery to improve clinical outcomes

**How?**
Use 24 hour volume-based feeding
- Formula rate is based on a 24 hour volume goal, rather than a set hourly rate
- Start with
  - Concentrated, well tolerated,
  - peptide-based formula
  - Modular protein supplements BID
  - Motility agents
- Monitor and Adjust as Needed
  - Gastric residual volume threshold = 300 mL
  - RN changes hourly feeding rate to achieve
    the 24 hour volume total, and reports nutrition adequacy at rounds

It’s Time to Get Pepped Up!

For more information, contact:
Tools: To Minimize Interruptions in EN

June 20, 2011
Endorsed: Department of Anesthesia and Perioperative Medicine

Critical Care Program
Kingston General Hospital

Guideline for Enteral Feeds and Surgical Procedures

Preamble
This guideline is meant to assist with the management of enteral feeding in critically ill patients that are going to the operating room for a procedure. Although it addresses most situations it does not replace clinical judgment. The treating team may make a decision that reflects the best care of an individual patient given specific circumstances.

1. For intubated patients (with an endotracheal, nasotracheal or tracheostomy tube) and with a post pyloric feeding tube or a feeding jejunostomy tube, enteral feedings should continue to the time that the patient is called for transport to the Operating Room for surgery. Feedings should then be held for the procedure. If an insulin infusion is being administered this should be discontinued.

2. For intubated patients with an orogastric tube or nasogastric tube (Salem sump type tube), feeds should be held just prior to transfer to the OR and the tube placed to suction to remove any residual gastric contents, prior to proceeding.

3. For intubated patients with a single lumen nasogastric feeding tube (Entriflex or other), or a percutaneous gastrostomy tube, feeds should be stopped on transport to the OR and aspiration of gastric contents should be done with a syringe. (Wall suction should not be used on these tubes.)

4. For intubated patients having manipulation of the airway (eg. change of ETT, laryngectomy) feeds should be discontinued 6 hours prior to the procedure at the direction of the anesthesiologist.

5. On return from the OR from non-abdominal surgery, feeds are to be resumed at their prior rate.

6. For patients that have undergone abdominal surgery, feeds should usually be restarted at a reduced rate (10mlh) until tolerance is established and advanced as per the feeding algorithm. There may be circumstances when the surgical team may direct that enteral feeding be held (eg. ischemic bowel or fistula).

7. Non-intubated patients who are either on an oral diet or receiving tube feeds should be fasting for a minimum of 6 hours prior to any elective surgical procedure. These patients can receive their medications with small amounts of water. (Cann J Anesthesiol Can Anesth 54:806-814)
Measuring Gastric Residual Volumes in Enteral Tube Fed Critically ill Patients: The end of an era?

For many years, measuring gastric residual volumes (GRV) have been part of a standardized assessment of tolerance to enteral nutrition (EN) in critically ill patients. Recently some investigators have challenged this practice citing the lack of reproducibility and validity of the measurement and that it is a major barrier to optimizing EN delivery. In a recent multicenter trial, Reignier and colleagues randomized 452 critically ill patients undergoing mechanical ventilation and receiving early EN to a strategy of not measuring GRV and not adjusting EN except in the case of vomiting or regurgitation (intervention group) compared to patients fed as per usual standards where GRV was checked four times a day with adjustment of enteral feeding rates if the GRV exceeded 250mL (the control group). They demonstrated that in the intention-to-treat population, VAP occurred in 38 of 227 patients (16.7%) in the intervention group and in 35 of 222 patients (15.8%) in the control group, a difference of 0.9% (90% confidence limits: -4.8% to 6.7%). There were no significant between group differences in other ICU-acquired infections, mechanical ventilation duration, ICU stay length, or mortality rates. As could have been expected, patients in the intervention group had a higher rate of vomiting (39.6% vs. 27%) and a smaller cumulative caloric deficit over the course of the first week in ICU (319 vs. 509 kcal). These differences in caloric intake are trivial but the rates of vomiting are high in both groups and in particular in the group that had no GRV measured. Notwithstanding, there were no differences in clinically important outcomes between the 2 groups. The authors concluded, “Residual gastric volume monitoring leads to unnecessary interruptions of enteral nutrition delivery with subsequent inadequate feeding and should be removed from the standard care of critically ill patients receiving invasive mechanical ventilation and early enteral nutrition.” The accompanying published editorial was entitled, “Gastric Residual Volume: End of an Era.”

Are we really ready to abandon measuring GRVs, as part of our standard enteral feeding protocols? We feel that it is premature to do so and we suggest ‘no’ for the following reasons:

1) While we respect that Reignier and colleagues conducted an internally valid trial, in our opinion, the conclusions by the authors and the statement of the corresponding editorial that monitoring GRV should be discontinued in all mechanically ventilated patients receiving early EN is an overstatement. We believe that the external validity or generalizability of the trial is limited. Patients were eligible if they were admitted to the ICU, expected to require more than 48 hours of invasive mechanical ventilation, and started on EN via a nasogastric tube within 36 hours after intubation. Patients with a history of recent abdominal surgery, esophageal, duodenal, pancreatic, or gastric surgery; bleeding from the esophagus, stomach, or bowel were excluded from the study. More than 90% of enrolled patients were medical and thus surgically critically ill patients, a subgroup of patient notoriously difficult to feed, were not adequately represented in this study. Moreover, whilst 50% of patients were on some form of vasoactive medication, we are not informed of their dose or the severity of shock in study patients. We posit that the results of this study are still not generalizable to all sick, multi organ failure and surgical patients. Measuring GRV is part of a feeding protocol. Feeding protocols represent a standardized approach to the management of the EN in all patients in a given ICU and as such, they should be developed and applied with the broadest range of ICU patients in mind. Until not measuring GRVs is shown to be safe and efficacious in a more heterogeneous patient population, we respectfully submit that measuring GRVs should be part of standard of care.
Prompts for
✓ high risk patients
✓ improving calorie and protein intakes (≥ 80% prescribed)
✓ starting motility agents, small bowel feeding, supplemental PN
Optimal nutrition by informing and capacitating family members of best nutrition practices

An intervention designed to educate families about the importance of nutrition during critical illness and recovery, and encourage them to advocate for better nutrition on behalf of their family member.

**Low intensity intervention**
- Education session and patient's nutrition history completed with family

**Moderate intensity intervention**
- Education session and patient's nutrition history completed with family  
- Daily nutrition diary following extubation and ICU discharge

**Inclusion criteria**
- Expected to be mechanically ventilated for at least 48 hours  
- Patient is ≥ 18 years old  
- Patient and family can talk and write in English  
- Family member expected to visit patient regularly while patient is in ICU and hospital

**Exclusion criteria**
- Patient is not expected to survive an additional 48 hours from screening  
- A lack of commitment to full aggressive care (anticipated withholding or withdrawing treatments in the first week but isolated DNR acceptable)  
- Patients receiving long-term tube feeding pre-admission or who it is anticipated will not be able to resume oral intake because of prolonged severe dysphagia

Help us recruit patients and their families!

Family Involvement

Engaging family members

Act as advocates for nutrition

Educated by ICU RD re: nutrition

may be a promising strategy to narrow the gap between best practice & current practice both in the ICU and post ICU

2 Australian, 2 Canada, 2 US ICUs
Need for a Tailored Approach

Select Intervention(s) (PERFECTIS Study)
Tailored Intervention:
Change strategies specifically chosen to address the barriers identified at a specific setting at a specific time
PERFormance Enhancement of the Canadian nutrition guidelines through a Tailored Implementation Strategy

Hypothesis

Barriers are inversely related to nutrition performance and tailoring change strategies to overcome barriers to change will reduce the presence of these barriers and lead to improvements in nutrition practice.

Cahill, N
KT Fellowship for PhD

Southeastern Ontario Academic Medical Organization Innovation Fund
**Nutrition Practice Audit**
- 20 patients

**Barriers Assessment**
- ICU staff

**Baseline**
- Identify strengths and weaknesses
- Identify barriers to change
- Small group problem solving

**Tailored Action Plan**
- 6 months

**Evaluation**
- 12 months
- 6 months

**Pre-test Post Test Feasibility Study in 7 ICUs in US and Canada**
Results

- Small improvement in nutritional adequacy (43% to 49%, 6% range -2 to 18%)
- Reduction in barriers was seen
- Compliance with the Action Plan varied across ICUs
- Intervention requires further refinement prior to formally testing its effectiveness

Cahill N et al Crit Care 2013 (In Submission)
Dissemination Methods

- Journal publications
- Podium and poster presentations at educational meetings
- CCN website: www.criticalcarenutrition.com
  - Quality Improvement tools
  - Google discussion groups
  - NIBBLES (nutrition information bytes)
- PEP UP Collaborative, BOB awards
Knowledge Translation on a Global level involves:

- **Knowledge Creation/Synthesis**
  - Clinical Practice Guidelines

- **Identification of gaps**
  - Audit and feedback with bench-marked site reports
  - Creating a culture of excellence

- **An assessment of barriers**
  - Understanding of organizational culture
  - Ways to overcome barriers (Protocols, Family Capacitation)

- **Select tailored interventions**
  - Adapting knowledge and action plans to local context

- **Ongoing, iterative, dissemination strategies**