Implementation of Clinical Practice Guidelines for Nutrition in the Critical Care Setting:
Time to narrow the gap!

Daren K. Heyland
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Kingston, ON Canada
Case Scenario

- Mr KT
- 76 per’d diverticulum
- Septic shock, ARDS, MODS
- Day 3 trickle feeds
- Feeds on and off again for whole first week
- No PN, no small bowel feeds, no specialized nutrients
Case Scenario

Prolonged ICU stay, discharged weak and debilitated. Dies on day 43 in hospital from massive PE.
Overall assessment of nutritional adequacy (% of calories prescribed)
Observational Studies on Hypocaloric Nutrition

- 48 critically ill patient

- Adjusted for SAPS II Score, SOFA score, BMI, age

- ↑ Caloric debt associated with:
  - ↑ Longer ICU stay (p=0.0001)
  - ↑ Days on mechanical ventilation (p=0.0002)
  - ↑ Complications (p=0.0003)

Villet et al. Clin Nutr 2005
Why such variation?

Suboptimal Patient Care?
 Pharmaconutrients Save Lives!

Effect on Mortality

- Glutamine
- Antioxidants
- Fish/Borage Oils Plus AOX

www.criticalcarenutrition.com
Information Overload
Impractical for individual clinicians to assimilate massive amounts of information to make unaided judgments about complex decisions.
Clinical Practice Guidelines

- “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances”
  - U.S. Institute of Medicine

- applies to the average patient
- Reduce variation, improve process of care and patient outcomes
Context of Guidelines

- Evidence-based Medicine
  - “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients”
Levels of Evidence

- Systematic reviews
- RCT’s
- Cohort Studies
- Case Control
- Case Series

less bias/strong inferences

more bias/weaker inferences
What is a GOOD guideline?

• Ideally, leads to improvement in patient outcomes
• This information rarely available
• Alternative:
  Have the producers of the CPG attempted to minimize bias in the complex process of creating the CPG?
Criteria for High Quality CPGs (1)

- **Scope:**
  - specific statement about the overall objectives, clinical questions and describes the target population.

- **Stakeholder involvement:**
  - information on the composition, discipline, and relevant experience of the development group.

- **Rigor of development:**
  - Provide detailed information on the search strategy, the inclusion/exclusion criteria, and methods used to formulate the recommendation (reproducible).
  - Transparent link between evidence, values, and resulting recommendation.
  - External review
  - Procedure for updating the CPG

AGREE Qual Saf Health Care 2003;12:18
Criteria for High Quality CPGs (2)

• Clarity and Presentation:
  – Contains specific recommendations on appropriate patient care and consider different possible options.
  – Key recommendations are easily found
  – A summary document and patient leaflet’s are provided.

• Applicability:
  – Discuss the organizational changes and cost implications of applying the recommendation and present criteria for monitoring the use of the CPG

• Editorial Independence:
  – Include an explicit statement that the views or interests of the funding body have not influenced the final recommendations.
  – Members of the group have declared conflicts of interest.

AGREE Qual Saf Health Care 2003;12:18
Special Interest

The following article is one of two articles offered for continuing education credit in this issue. Please see page 382 for details.

**Canadian Clinical Practice Guidelines for Nutrition Support in Mechanically Ventilated, Critically Ill Adult Patients**

Daren K. Heyland, MD, FRCPC, MSc; Rupinder Dhaliwal, RD; John W. Drover, MD, FRCSC, FACS; Leah Gramlich, MD, FRCPC; Peter Dodek, MD, MHSc; and the Canadian Critical Care Clinical Practice Guidelines Committee

*From the *Department of Medicine and the *Department of Surgery, Queen’s University, Kingston, Ontario; *Department of Medicine, Division of Gastroenterology, University of Alberta, Edmonton; and *St. Paul’s Hospital, Center for Health Evaluation and Outcome Sciences, Vancouver, British Columbia, Canada*

- Updated January 2007
- Summarizes 156 trials studying 15080 patients
- 34 topics → 17 recommendations

www.criticalcarenutrition.com
Process for Developing Canadian CPGs

- First steps
  - Establishing a protocol/process
  - Select a panel
  - Declare conflicts of interest

- Preparatory steps
  - Identify, appraise, prepare systematic reviews of best available evidence
  - Prepare evidence profiles of each intervention on important outcomes

- Grading the quality of the evidence and strength of the recommendation
  - Rating the quality of the evidence, the relative importance of the outcomes, balance between risk, benefits, and costs.
  - Determine the strength of the clinical recommendation in a transparent fashion

- Validation
- Implementation and Evaluation
Will adoption of the Canadian CPGs result in improved nutrition support practice?
Validation of the CPG’s: Results of a Prospective Observational Study

• Summary
  – Patients and Sites that were more consistent with CPG recommendations tended to receive more EN

Adoption of Canadian CPGs will likely lead to improved nutrition support practices in ICUs

Heyland CCM 2004;32:2260
How to change?

CPGs to bedside

Guidelines

Bedside

Dissemination and Implementation Strategies
Scurvy was responsible for more deaths at sea than war, piracy, storms and shipwreck combined. For centuries the scourge of the seas was treated with ineffective remedies...
In 1601, an English Captain named John Lancaster discovered a cure for scurvy. Yet it took 200 years for this practice to become established practice!
## Theoretical Model For Knowledge Translation

### Perspective of Target

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Awareness</th>
<th>Agreement</th>
<th>Adoption</th>
<th>Adherence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Predisposing</strong></td>
<td>Distribution of Posters Pocket Cards Access to website</td>
<td></td>
<td></td>
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<tr>
<td><strong>Enabling</strong></td>
<td></td>
<td>Opinion leaders</td>
<td>Interactive workshop</td>
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<td></td>
<td></td>
<td>Academic Detailing</td>
<td>Small group session</td>
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<td></td>
<td></td>
<td>Teleconference</td>
<td>Audit &amp; Feedback</td>
<td></td>
</tr>
<tr>
<td><strong>Reinforcing</strong></td>
<td></td>
<td></td>
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<td>Site Reports</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Reminders via email</td>
<td></td>
</tr>
</tbody>
</table>

Pathman Med Care 1996;34:873
Implementation of CPGs

A Cluster randomized trial comparing 2 methods of dissemination of Canadian CPGs

Passive meetings and hard copy

Active Interactive Workshops Web based tools and training

Systematic Reviews of Professional Behavior Change Strategies

• Generally Ineffective
  – peer-reviewed publications
  – didactic lectures

• Mixed Effects
  – Local opinion leaders
  – Audit and feedback

• Generally Effective
  – Academic outreach activities
  – Reminders
  – Multifaceted interventions

Grimshaw Med Care 2001;39:2-45.
Cluster Randomized Control Trial

- Passive Strategies
  - copy of published Canadian CPGs
  - presented at national meetings

- Active Strategies
  - as above plus
  - dietitians positioned as local opinion leaders
  - web-based tools including benchmarked site reports
  - interactive workshops with small group problem solving
  - training on rapid cycle change
  - educational reminders (manuals, posters, pocket cards)
  - academic detailing by phone
Critical Care Nutrition

What we offer?
We are dedicated to the improvement in nutrition therapies in intensive care units across the world.
We bring to you...

Register Now for International Survey January 2007:
You are invited to illuminate gaps in your current practice by participating in an online survey of nutrition therapy in the critically ill (Details, Register)

- The latest evidence based recommendations for nutrition therapies in the ICU (here)
- Tools to assist in implementing the evidence from the Clinical Practice Guidelines (here)

And much more...

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www.criticalcarenutrition.com
13. **Prophylaxis: (cont’d)**
   **Ventilator Associated Pneumonia:**
   Thoroughly swab the surface of the patient’s oral cavity with 15 mL of 0.12% chlorhexidine oral rinse q6 h using a Toothette oral swab.
   Attempt to elevate head of bed to $45^\circ$, unless contraindicated. Document angle q shift.
   **Constipation:**
   Docusate 100 mg PO/NG/feeding tube tid.
   Sennosides 10 mL PO/NG/feeding tube qhs if patient is receiving opioids.
   Bisacodyl suppository 10 mg PR daily if no bowel movement for 48 hours. Notify physician if no bowel movement for more than 48 hours.
   Hold constipation prophylaxis for 24 hours if patient develops diarrhea.

14. **Feeding:**
   **Physician to place feeding tube as soon as possible.**
   □ NPO. To be reassessed in 1 day.
   **OR**
   □ Physician to complete an ICU Gastric and Intestinal Feeding Order form and consult dietitian.

15. **Electrolyte Replacement:**
   If serum $K^+$ is less than 2 mmol/L or, for patients on digoxin, if $K^+$ is less than 2.5 mmol/L, contact physician.
   □ If serum $K^+$ is less than 3.5 mmol/L and potassium phosphate has not been administered since serum $K^+$ sampled:
   If patient has functioning gastrointestinal tract:
<table>
<thead>
<tr>
<th>ORDER AND SIGNATURE</th>
<th>TRANSCRIPTION &amp; RN NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GASTRIC AND INTESTINAL FEEDING ORDERS (ADULT)</strong></td>
<td></td>
</tr>
<tr>
<td>1. ☐ Consult dietitian re: assessment of nutritional requirements and recommendations for tube feeding.</td>
<td></td>
</tr>
<tr>
<td>2. ☐ Baseline investigations: CBC, INR, PTT, creatinine, urea, electrolytes, serum glucose, albumin, prealbumin, calcium, magnesium, phosphate.</td>
<td></td>
</tr>
<tr>
<td>3. ☐ CXR to confirm initial tube placement.</td>
<td>OR ☐ tube placement confirmed (gastric, intestinal) (e.g. radiographically, endoscopically)</td>
</tr>
<tr>
<td>4. Elevate head of bed 30° during feedings and for 1 hour after feedings, unless contraindicated.</td>
<td></td>
</tr>
<tr>
<td>5. Begin full strength liquid at 25 mL/h after initial tube placement confirmed.</td>
<td></td>
</tr>
<tr>
<td>6. ☐ Monitor gastric residual volumes as per Adult Gastric Feeding Flow Chart on back of Orders.</td>
<td></td>
</tr>
<tr>
<td>7. Increase feeding rate by 25 mL/h q4 h up to _______ mL/h (for gastric feedings follow Adult Gastric Feeding Flow Chart on back of Orders).</td>
<td></td>
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<tr>
<td>8. Docusate sodium elixir 100 mg BID via feeding tube.</td>
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<tr>
<td>10. Monitor intake and output, and stool output.</td>
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</tr>
<tr>
<td>11. q Monday and Thursday: Creatinine, urea, electrolytes and prealbumin. q Monday: Albumin, calcium, magnesium, phosphate, 24 hour urine for urea (start Sunday, complete Monday).</td>
<td></td>
</tr>
<tr>
<td>12. Flush tube with at least 10 mL saline solution q4 h during feedings, at beginning and end of feedings, after aspiration for residuals, and before and after medication administration.</td>
<td></td>
</tr>
<tr>
<td>13. ☐ If unable to flush, declog tube with pancrelipase 8,000 units mixed with crushed sodium bicarbonate 300 mg in 5mL warm water pm.</td>
<td></td>
</tr>
</tbody>
</table>

**Physician Signature:**

**Printed Name:**

**Date & Time:**
ENTERAL NUTRITION (EN) FEEDING GUIDELINE

1) Initiate EN within 24 - 48 hours of admission**
2) Deliver >90% of required calories on a daily basis.

Elevate HOB >45°*. Initiate EN at 25 ml/hr.

---

1st residual > Maximum GRV?
1) Refeed residual to maximum 400 ml; discard excess.
2) Go to PROKINETIC GUIDE (pink box).
3) Continue feeds at same rate.
4) Continue in white section.
2nd consecutive residual > Maximum GRV?
1) Continue below in green section.

---

YES

Q4H residual > Maximum

NO

1) Refeed gastric residual.
2) Continue feeds at same rate if at goal rate; ↑ feeds by 25 ml/hr if not at goal rate.

---

FEEDING GUIDE:
- Metoclopramide** 10 mg IV Q6H (Q8H if renal function).
- Metoclopramide if already receiving.

---

EASY

---

GRV: 250 ml*

---

FEEDING GUIDE:
Insert nasoduodenal feeding tube (NDFT)** (refer to Support Guideline for placement methods).

---

GRV:
- after 4 doses of metoclopramide, go to SMALL BOWEL FEEDING GUIDE (purple box).

---

Developed by: Jan Greenwood, RD (Vancouver General Hospital) in collaboration with the CCCCPGC (21/7/03).
Daily Enteral Nutrition Checklist

Admission Date: ______________________

<table>
<thead>
<tr>
<th>ICU Day</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal Calories (Kcals)</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Calories Received (Kcals)</td>
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<tr>
<td>Meeting &gt;80% of Goal calories (Y/N)</td>
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<td></td>
<td></td>
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<tr>
<td>If No:</td>
<td></td>
<td></td>
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<tr>
<td>Motility agents prescribed? (Y/N)</td>
<td></td>
<td></td>
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<tr>
<td>Small bowel feeding tube placed? (Y/N)</td>
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<tr>
<td>RD review requested? (Y/N)</td>
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<tr>
<td>Other comments:</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
• **Early vs Delayed Nutrition Intake**

  - Recommendations: Based on 8 level 2 studies, we recommend early enteral nutrition (within 24-48 hrs following resuscitation) in critically ill patients.
Design

Before
May 2003
Data collection

Randomization

Active

Passive

After
May 2004
Data Collection
Completed baseline assessment:
25 clusters (30 ICUs) with a mean cluster size of 13.0 (range 4-50) for a total of 325 patients.

Completed follow up assessment:
25 clusters (30 ICUs) with a mean cluster size of 12.3 (range 3-44) for a total of 307 patients.

Completed baseline assessment:
25 clusters (28 ICUs) with a mean cluster size of 11.9 (range 5-34) for a total of 298 patients.

Completed follow up assessment:
25 clusters (28 ICUs) with a mean cluster size of 12.2 (range 4-30) for a total of 305 patients.
Results of Cluster RCT

EN Adequacy

Overall change from baseline = 7.2% (p<0.001)

B=Baseline, F=Follow-Up
Results of Cluster RCT

EN Adequacy for Medical Patients

% Prescribed Calories Received by EN

change from baseline
(active)=10.0%
vs. 1.9% in passive group
(p=0.04)
No Differences Between Groups

- **Nutrition Support Practices:**
  - Type of nutrition support received
  - EN started within 48 hours
  - small bowel feeding, motility agents
  - feeding protocols, HOB
  - use of glutamine, IV lipids

- **Clinical Outcomes:**
  - ICU LOS
  - Mortality
Why Such Minimal Effect?

• Guideline implementation is complex

• Existing studies on adherence to CPGs:
  - Practitioner
  - Intra-disciplinary
  - Outside ICU
  - Non-nutritional

• Need to identify barriers and enablers to nutrition guideline adherence in the ICU
Understanding Guideline Implementation

- Multiple case study
  - 4 case ICU sites
  - 28 Semi-structured key informant interviews

Jones NCP 2008 (in press)
## Identified Barriers

<table>
<thead>
<tr>
<th>Guidelines</th>
<th>Practitioner</th>
<th>Institution</th>
<th>Patient</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Information overload</td>
<td>• Lack of awareness</td>
<td>• Community Hospital setting</td>
<td>• Poor clinical condition</td>
</tr>
<tr>
<td>• Weak evidence</td>
<td>• Limited critical care experience</td>
<td>• Open ICU</td>
<td>• Surgical</td>
</tr>
<tr>
<td>• Impractical / Complex</td>
<td>• Resistance to change</td>
<td>• Slow administrative process</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Resource constraints</td>
<td></td>
</tr>
<tr>
<td><strong>Institution</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Community Hospital setting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Open ICU</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Slow administrative process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Resource constraints</td>
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</tbody>
</table>
Enablers

- Agreement of the attending physician & ICU team
- Part of routine practice (algorithms/PPO)
- Dietitian / Opinion leader
- Access / Visibility
- Easy to follow and perform
- Provision of education
- Open discussion
Successful Implementation Strategies

• Informal one-on-one discussions
  – Academic detailing, ward rounds

• Bed-side reminders
  – Check-list, algorithms,

• Feedback and audit
  – Site reports
Framework for Adherence to CPGs in the ICU

Legend:
*Italics = New themes
ICU = Intensive Care Unit
Survey of Attitudes towards the Canadian Nutrition Support Clinical Practice Guidelines

• Internet based questionnaire
• Distributed through membership of Canadian Critical Care Society, SCCM, ASPEN, and posted on www.criticalcarenutrition.com
• Preliminary results (still accepting responses)
When you think of mechanically ventilated, critically ill adult patients, how important do you believe nutrition therapy is? (Select one)

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very important</td>
<td>91.5%</td>
<td>440</td>
</tr>
<tr>
<td>Somewhat important</td>
<td>7.3%</td>
<td>35</td>
</tr>
<tr>
<td>Neither important or unimportant</td>
<td>0.6%</td>
<td>3</td>
</tr>
<tr>
<td>Somewhat unimportant</td>
<td>0.4%</td>
<td>2</td>
</tr>
<tr>
<td>Not important at all</td>
<td>0.2%</td>
<td>1</td>
</tr>
<tr>
<td>No opinion</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

answered question 481
Early vs Delayed EN

We recommend early EN (within 24-48 hours following admission)
Enteral nutrition should be initiated early (24-48 hours following admission to ICU).

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Response Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly recommend</td>
<td>67.2%</td>
<td>310</td>
</tr>
<tr>
<td>Recommend</td>
<td>24.3%</td>
<td>112</td>
</tr>
<tr>
<td>Should be considered</td>
<td>6.9%</td>
<td>32</td>
</tr>
<tr>
<td>Insufficient data</td>
<td>1.1%</td>
<td>5</td>
</tr>
<tr>
<td>Disagree</td>
<td>0.4%</td>
<td>2</td>
</tr>
<tr>
<td>Don't know</td>
<td>0.0%</td>
<td>0</td>
</tr>
</tbody>
</table>

answered question 461
## Composition of Nutrition Support

<table>
<thead>
<tr>
<th>Formula</th>
<th>Total % Patients Ever on EN receiving formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arginine-supplemented formulas</td>
<td>5.3 % (0.0-92.3)</td>
</tr>
<tr>
<td>Glutamine supplementation</td>
<td>7.2 % (0-100)</td>
</tr>
<tr>
<td>Oxepa (All)</td>
<td>1.4 % (0-40)</td>
</tr>
<tr>
<td>Oxepa (ARDS)</td>
<td>4.1 % (0-100)</td>
</tr>
<tr>
<td>Polymeric</td>
<td>91.2 % (0-100)</td>
</tr>
</tbody>
</table>
Enteral formulas supplemented with fish oil, borage oils, and antioxidants should be used in patients with ARDS.

<table>
<thead>
<tr>
<th>Response</th>
<th>Percent</th>
<th>Count</th>
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<tbody>
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<td>Strongly recommend</td>
<td>18.2%</td>
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</tr>
<tr>
<td>Recommend</td>
<td>25.1%</td>
<td>109</td>
</tr>
<tr>
<td>Should be considered</td>
<td>25.3%</td>
<td>110</td>
</tr>
<tr>
<td>Insufficient data</td>
<td>22.3%</td>
<td>97</td>
</tr>
<tr>
<td>Disagree</td>
<td>1.6%</td>
<td>7</td>
</tr>
<tr>
<td>Don't know</td>
<td>7.6%</td>
<td>33</td>
</tr>
</tbody>
</table>

answered question 435
Conclusions

• Long way to go to narrow the quality gap
• Need to enrich our understanding on how best to achieve that; more research needed.
• In the mean time...
To Achieve Best Practice...

• System
  – All staff educated and motivated
  – Reminders in the forms of pocket cards, posters, electronic correspondence, etc.
  – Bedside Algorithms and Pre-printed orders or other tools that automate processes
  – Formulas and tubes readily available
  – Ongoing audits and quality improvement

• On an individual patient basis
  – Dietitian daily monitors success
  – Nurse reports on yesterday’s adequacy