Benchmarking your ICU’s feeding performance: How early is early?

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Potential conflicts

Gordon S. Doig

Relevant financial relationships with a commercial interest:

- **Fresenius Kabi**, Academic Research Grants (Past), Consultant and Speaker’s Honoraria (Current)
- **Baxter Healthcare**, Academic Research Grant (Current), Consultant and Speaker’s Honoraria (Current)
- **Nestle Healthcare**, Academic Research Grant (Current), Consultant and Speaker’s Honoraria (Current)
Overview

• Review the evidence regarding nutrition in the ICU.

• Review major ICU nutrition guidelines.

• Understand current practice.

• Summary.
The initial MEDLINE/EMBASE electronic search retrieved 2,287 abstracts. Hand-searching of abstracts and reference lists of all overviews and guidelines (GSD and FS) resulted in the retrieval of 465 papers. Of these 465 papers, 337 appeared to be primary nutritional support studies and were identified for detailed review (GSD, FS, and AD). On detailed review 103 studies were found not to report any clinically meaningful outcomes, 42 were not conducted in critically ill patients, 27 were not primary nutritional support studies (i.e., evaluations of recombinant human growth hormone, insulin), 15 were crossover studies, 12 evaluated preoperative interventions, 8 were true observational studies (not controlled trials), 7 were non-English-language studies, 6 were pseudo-randomized, 5 were based on subgroups of patients from a larger published trial, and 1 was a postoperative intervention (oral intake for 10 weeks postsurgery). The remaining 111 articles were found to be primary nutritional support studies reporting clinically meaningful outcomes (11) conducted in critically ill patient populations. A complete listing of all 111 articles is presented in Appendix A.

Effect of Evidence-Based Feeding Guidelines on Mortality of Critically Ill Adults: A Cluster Randomized Controlled Trial

Gordon S. Doig; Fiona Simpson; Simon Finfer; et al.


http://jama.ama-assn.org/cgi/content/full/300/23/2731

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Box. Evidence-Based Recommendations Approved (Ratified) for Inclusion in the Guideline at the Consensus Conference

**Grade B+**
Recommendation favoring enteral nutrition over standard care (nothing by mouth)

Recommendation favoring early parenteral nutrition (<24 hours) over delayed (>24 hours) enteral nutrition
- 5 Level II RCTs. Supported by positive meta-analysis and validated evidence-based guideline (ACCEPT).

**Grade B**
Recommendation favoring early enteral nutrition (<24 hours) over delayed (>24 hours) enteral nutrition
- 3 Level II RCTs. Supported by validated evidence-based guideline (ACCEPT).

Recommendation favoring parenteral nutrition over standard care (intravenous glucose)
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Recommendation favoring early enteral nutrition (<24 hours) over parenteral nutrition
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Recommendation favoring postpyloric feeding when gastric feeding not tolerated
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Recommendation favoring prokinetics when gastric feeding not tolerated
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Recommendation favoring enteral nutrition supplemented with parenteral nutrition if 80% of goals not met by 72 hours with enteral nutrition alone (after consideration of postpyloric feeding, prokinetics, or both)
- 4 Level II RCTs. Supported by validated evidence-based guideline (ACCEPT).

Recommendation favoring protocolized management of diarrhea
- Supported by validated evidence-based guideline (ACCEPT).

Recommendation favoring protocolized definition of intolerance of enteral nutrition, which includes gastric residual values > 200 mL
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**Grade B–**
Consider parenteral nutrition with glutamine instead of standard parenteral nutrition
- 4 Level II RCTs. Supported by meta-analysis, heterogeneity present.

Glutamine may be beneficial in select patients. To identify which patients may benefit, each constituent RCT should be reviewed and clinical judgment should be exercised.
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**early (< 24 h) EN in critical illness**
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Primary analysis
- Included only methodologically sound RCTs.

early (< 24 h) EN in critical illness

Primary analysis

• Included only methodologically sound RCTs.

Simulation analysis

• Daren Heyland’s 2003 meta-analysis recommends EN within 48 h.
• We duplicated his selection and analysis process, but only included trials where EN was initiated within 24 h of injury or ICU admission.


Potentially relevant papers identified and retrieved (N = 675)

Papers excluded, with reasons (N = 170)
Not RCTs (Letters, observational studies, systematic reviews, narrative reviews, previous meta-analyses)

RCTs identified for detailed evaluation (N = 505)

RCTs excluded, with reasons (N = 475)
329 Did not provide a primary comparison of timing of EN (includes 5 pseudo-randomised trials + 99 trials not reporting clinically meaningful outcomes)
72 Not adult critically ill population
46 Not primary nutritional support intervention (GH etc)
16 Cross-over trials
13 Pre-operative interventions

RCTs evaluating timing of EN (N = 30)

Excluded RCTs (N = 24)
7 - Early EN not started within 24 h of injury or ICU admission
4 - Patient oriented outcomes not reported (no mortality etc)
5 - Not critically ill patient population
2 - Early post-op oral intake, not early EN
2 - EN commenced at same time in both groups
1 - Immuno-enhanced EN (Impact)
2 - Excessive loss to follow-up
1 - Subgroup from a larger trial

Included in primary analysis (N = 6)
On topic, included in primary analysis

Chiarelli, 1990: 20 pts, burns
Kompan, 1999: 36 pts, trauma
Kompan, 2004: 52 pts, trauma
Nguyen, 2008: 28 pts, med/surg critically ill
Chuntrasakul, 1996: 38 pts, trauma
Pupelis, 2001: 60 pts, severe pancreatitis and peritonitis

## early (< 24 h) EN in critical illness: mortality

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>early EN (&lt;24 h) n/N</th>
<th>Control n/N</th>
<th>OR (fixed) 95% CI</th>
<th>Weight %</th>
<th>OR (fixed) 95% CI</th>
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</thead>
<tbody>
<tr>
<td>Chiarelli 1990</td>
<td>0/10</td>
<td>0/10</td>
<td>Not estimable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kompan 1999</td>
<td>0/17</td>
<td>2/19</td>
<td>13.40 [0.20, 4.47]</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Kompan 2004</td>
<td>0/27</td>
<td>1/25</td>
<td>8.89 [0.30, 7.63]</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Nguyen 2008</td>
<td>6/14</td>
<td>6/14</td>
<td>19.95 [0.01, 4.47]</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Chuntrasakul 1996</td>
<td>1/21</td>
<td>3/17</td>
<td>18.38 [0.23, 2.48]</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Pupelis 2001</td>
<td>1/30</td>
<td>7/30</td>
<td>39.38 [0.11, 0.99]</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td>119</td>
<td>115</td>
<td>100.00 [0.34, 0.85]</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

Total events: 8 (early EN (<24 h)), 19 (Control)
Test for heterogeneity: Chi² = 3.20, df = 4 (P = 0.52), I² = 0%
Test for overall effect: Z = 2.31 (P = 0.02)

### Significant reduction in mortality (10% absolute reduction, **P=0.02**)

Review: Early EN (<24h) vs Control (Primary Analysis)
Comparison: 01 early EN vs Control
Outcome: 02 Pneumonia, Intention to treat analysis

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<th>Study or sub-category</th>
<th>early EN (&lt;24 h)</th>
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<th>OR (fixed) 95% CI</th>
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<tr>
<td>Kompan 2004</td>
<td>9/27</td>
<td>16/25</td>
<td>70.15 0.28 [0.09, 0.88]</td>
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<td>Nguyen 2008</td>
<td>3/14</td>
<td>6/14</td>
<td>29.85 0.36 [0.07, 1.91]</td>
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<tr>
<td>Total (95% CI)</td>
<td>41</td>
<td>39</td>
<td>100.00 0.31 [0.12, 0.78]</td>
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</tr>
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Total events: 12 (early EN (<24 h)), 22 (Control)
Test for heterogeneity: Chi² = 0.06, df = 1 (P = 0.80), I² = 0%
Test for overall effect: Z = 2.47 (P = 0.01)

- Significant reduction in pneumonia (27% absolute reduction, P=0.01)

Simulation study: Heyland’s 2003 MA

- We conducted a simulation study to test the appropriateness of key assumptions behind our study selection and analysis techniques.

- We duplicated Heyland’s 2003 MA,
  - we used Heyland’s selection process and analysis techniques
  - BUT we only included articles that provided EN within 24 h of injury or ICU admission

**Simulation study: Heyland’s 2003 MA**

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>Early EN (&lt;60 h)</th>
<th>Control</th>
<th>RR (random)</th>
<th>Weight</th>
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<tbody>
<tr>
<td></td>
<td>n/N</td>
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<tr>
<td>Chiarelli</td>
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<td>Moore</td>
<td>1/32</td>
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<td>0.48 [0.05, 5.07]</td>
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<td>Pupelis</td>
<td>1/30</td>
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<td>Total (95% CI)</td>
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<td>0.52</td>
<td>0.52 [0.25, 1.08]</td>
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<td>Test for heterogeneity: Chi² = 4.05, df = 6 (P = 0.67), I² = 0%</td>
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<td>Test for overall effect: Z = 1.76 (P = 0.08)</td>
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- **Trend** towards a reduction in mortality (8% absolute reduction, P=0.08)

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- Test for overall effect: $Z = 1.76$ ($P = 0.08$)

**Trend** towards a reduction in mortality (8% absolute reduction, $P=0.08$)

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• **Trend** towards a reduction in mortality (8% absolute reduction, P=0.08)

**Simulation study: Heyland’s 2003 MA**

**Review:** Heyland Early EN  
**Comparison:** 01 Mortality  
**Outcome:** 01 Mortality

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<tr>
<td>Chiarelli</td>
<td>0/10</td>
<td>0/10</td>
<td>Not estimable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chuntrasakul</td>
<td>1/21</td>
<td>3/17</td>
<td>11.14 0.27 [0.03, 2.37]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eyer (average time to early EN: 31 h)</td>
<td>2/19</td>
<td>2/19</td>
<td>15.27 1.00 [0.16, 6.38]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kompan</td>
<td>0/14</td>
<td>1/14</td>
<td>5.39 0.33 [0.01, 7.55]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minard (&lt;60 h)</td>
<td>1/12</td>
<td>4/15</td>
<td>12.42 0.31 [0.04, 2.44]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moore</td>
<td>1/32</td>
<td>2/31</td>
<td>9.51 0.48 [0.05, 5.07]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pupelis</td>
<td>1/30</td>
<td>7/30</td>
<td>12.70 0.14 [0.02, 1.09]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singh (&lt;48 h)</td>
<td>4/21</td>
<td>4/22</td>
<td>33.57 1.05 [0.30, 3.66]</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td>159</td>
<td>158</td>
<td>100.00 0.52 [0.25, 1.08]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total events: 10 (Early EN (<60 h)), 23 (Control)
Test for heterogeneity: Chi² = 4.05, df = 6 (P = 0.67), I² = 0%
Test for overall effect: Z = 1.76 (P = 0.08)

- **Trend** towards a reduction in mortality (8% absolute reduction, P=0.08)

### Simulation study: Heyland’s 2003 MA

**Review:** Heyland Early EN  
**Comparison:** 01 Mortality  
**Outcome:** 01 Mortality

<table>
<thead>
<tr>
<th>Study or sub-category</th>
<th>Early EN (&lt;60 h) n/N</th>
<th>Control n/N</th>
<th>RR (random)</th>
<th>Weight %</th>
<th>RR (random)</th>
</tr>
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</tr>
<tr>
<td><strong>Total (95% CI)</strong></td>
<td>107</td>
<td>102</td>
<td>100.00</td>
<td>0.26</td>
<td>0.26 [0.08, 0.83]</td>
</tr>
</tbody>
</table>

Total events: 10 (Early EN (<60 h)), 23 (Control)  
Test for heterogeneity: $\chi^2 = 4.05$, df = 6 (P = 0.67), $I^2 = 0\%$  
Test for overall effect: $Z = 1.76$ (P = 0.08)

**Favours treatment**  
**Favours control**

- **Significant** reduction in mortality (10% absolute reduction, $P=0.02$)

**Therefore, evidence of benefit has been present in our literature since at least 2003, if early EN is defined as < 24 h from admission or injury!!!**
Background: Review of the Guidelines

Five major clinical practice guidelines recommend *early* EN.
Background: Review of the Guidelines

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- Canadian guideline,

Five major clinical practice guidelines recommend early EN.

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- **Canadian guideline,**
- **ACCEPT guideline (also Canadian),**
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Five major clinical practice guidelines recommend *early* EN.

- **Canadian guideline,**
  - *< 24 h*
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**Background: Review of the Guidelines**

Five major clinical practice guidelines recommend *early* EN.

- **< 48 h** – *Canadian guideline*,
  
- **< 24 h** – *ACCEPT guideline (also Canadian)*,
  
- **< 24 h** – *Australian and New Zealand guideline*,
  
- **< 24 h** – *European (ESPEN) guideline and*
  
- **< 48 h** – *American (ASPEN and SCCM) guideline*

Evidence of trend.

Significant evidence.

Significant evidence.

Significant evidence.

Evidence of trend.

---


Global practice: Do we deliver early EN?
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Survey of 1,637 patients from 81 ICUs in 18 countries

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- 65% of patients who received EN were started within 48 h

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- Active Nutrition Guideline Implementation (14 ICUs):


Global practice: Do we deliver early EN?

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Clinical trial of 1,118 patients from 27 ICUs in 2 countries (ANZ):

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- Active Nutrition Guideline Implementation (14 ICUs):
  - 72.1% of patients who received EN were started within 48 h


Survey of 1,637 patients from 81 ICUs in 18 countries

- *24 h metric not reported*
- 65% of patients who received EN were started within 48 h

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Global practice: Do we deliver early EN?

Survey of 1,637 patients from 81 ICUs in 18 countries

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Clinical trial of 1,118 patients from 27 ICUs in 2 countries (ANZ):

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  - 46.6% of patients who received EN were started within 24 h
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Practice change in the ICU

Change management encompasses a broad set of theories and structured processes aimed at helping to transition individuals, teams and organisations from a current state to a desired future state.

Smith WR. Evidence for the effectiveness of techniques to change physician behavior. Chest 2000;118(2) Suppl :8S-17S
Practice change in the ICU

*Change management* encompasses a broad set of theories and structured processes aimed at helping to transition *individuals, teams* and *organisations* from a current state to a desired future state.

Practice change strategies should be *theory driven* and *evidence based*.

- supported by evidence that proves the theory correct.

Smith WR. Evidence for the effectiveness of techniques to change physician behavior. *Chest* 2000;118(2) Suppl :8S-17S
1) Understand the evidence
   • Conduct a formal critical appraisal of methodological quality.
Efficient and effective change

2) Conduct an Audit

- Review your own practice and your ICU’s practice over time.
2) Conduct an Audit

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- Undertake an external comparison to similar hospitals.
  - *Remember to use the correct metric: Early = within 24 h!!*
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Efficient and effective change

2) Conduct an Audit

- Promotes awareness of the need for change.
- Allows clinicians to see ‘others’ using the new technology.
- Regarded as being a *moderately strong* motivator for change.

Efficient and effective change

3) Provide feedback
Efficient and effective change

3) Provide feedback: Academic Detailing
3) Provide feedback: Academic Detailing

*Academic Detailing* is the single most powerful way to change physician practice patterns when conducted peer to peer.


Efficient and effective change

3) Provide feedback: Academic Detailing

*Academic Detailing* is the single most powerful way to change physician practice patterns when conducted *peer to peer*.

“short, one-to-one conversations between a detailer and a practitioner with the goal of persuading the detailee to change behavior through the provision of *useful information and evidence*”


4) Add tincture of time.

Efficient and effective change

4) Add tincture of time.

Efficient and effective change

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Efficient and effective change

5) Repeat steps 2, 3 and 4 as required.

Efficient and effective change: Recap

1) Understand the evidence

2) Conduct an audit

3) Provide feedback: Academic detailing

4) Add tincture of time.

5) Repeat steps 2, 3 and 4 as required.

Summary
The evidence supporting patient benefits from the provision of Early EN is robust if early is defined as < 24 h from ICU admission.

- meta-analyses demonstrate early EN may improve survival
- 3 out of 5 major guidelines recommend commencing EN within 24 h
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Summary

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How is your ICU performing?
We would like to invite you to participate:

Nutrition Support in Critical Illness

This Audit of Nutrition Support in Critical Illness is being conducted by the University of Sydney's Northern Clinical School Intensive Care Research Unit. The primary purpose of this project is to benchmark current practice within hospitals throughout the world in order to provide useful information to participating sites to support local quality improvement initiatives to achieve best practice targets. Click here for additional information about this project. After reading the additional information, if you would like to participate, contact Gordon S. Doig or Philippa T. Heighes.

This is a secure, password protected web site. Access is restricted to participating hospitals only.

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MSIE Version: 6 or higher: false
MSIE Version: 5 or higher: false
Mozilla Version: 4 or higher: false
Your browser supports: Javascript 1.3
1975
How is your ICU performing?

- A Global audit of time from ICU admission to commencing nutrition therapy.
How is your ICU performing?

- A Global audit of time from ICU admission to commencing nutrition therapy.
- Very simple data collection.
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Data Collection Form: ICU Nutrition Audit

Please record all patients remaining in your ICU at least 3 calendar days, who did not receive oral nutrition on day of ICU admit (Day 1) or the day after ICU admission (Day 2).

<table>
<thead>
<tr>
<th>Initials</th>
<th>Sequential Number</th>
<th>ICU Admission</th>
<th>Feeding Start or ICU discharge</th>
<th>Type of Feeding Started</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>dd/mm/yy</td>
<td>24 h clock</td>
<td>(1) Enteral Nutrition; (2) Parenteral Nutrition; (3) EN+PN; (4) Oral feeding; (5) No feeding started.</td>
</tr>
</tbody>
</table>
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• If your data suggests you could improve practice, Phase II of the project will help you improve by providing you with a comprehensive change management strategy to focus on the aspect of nutrition therapy that needs change.
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- No costs involved (to you or your hospital).
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MSIE Version 5 or higher: true
MSIE Version 6 or higher: false
MSIE Version 7 or higher: true
 Netscape / Mozilla Version 4 or higher: false
Your browser supports JavaScript 1.3
1995
Questions?