Understanding the benefits of early enteral nutrition in the major trauma patient requiring intensive care: From clinical trials to costs.

Dr. Gordon S. Doig  
Associate Professor in Intensive Care  
Northern Clinical School Intensive Care Research Unit,  
University of Sydney, Sydney, Australia  
www.EvidenceBased.net  
gdoig@med.usyd.edu.au  

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Summary of this talk

- Provide a context.
- Review the most recent clinical evidence.
- Generate concise clinical recommendations.
- Summarize.
Background: Review of the Guidelines

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- Five major ICU CPGs recommend early EN.
  - Canadian guideline,
  - ACCEPT guideline (also Canadian),
  - Australian and New Zealand guideline,
  - European (ESPEN) guideline and
  - American (ASPEN and SCCM) guideline


The concept of ‘early’ enteral feeding was popularized in the mid ‘80s.

Five major ICU CPGs recommend *early* EN.

One major trauma CPG recommends *early* EN.
Background: Review of the Guidelines

- The concept of ‘early’ enteral feeding was popularized in the mid ‘80s.
- Five major ICU CPGs recommend early EN.
- One major trauma CPG recommends early EN.

“enteral feeding can be instituted in most patients after resuscitation is complete and hemodynamic stability has been gained.”

Early EN in trauma: Direct evidence
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Early EN in trauma: Direct evidence

- RCT's conducted in:
  - adult trauma patients requiring intensive care and;
  - standard EN begun within 24hrs of injury compared to standard care (oral intake upon return of bowel sounds, TPN, or TPN + delayed EN);
  - conducted an extensive electronic literature search

## Early EN in trauma: Direct evidence

### Table 2
Characteristics of eligible studies.

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  - Excessive loss to follow-up is a major validity flaw.


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Primary analysis: RCTs without major flaws

Mortality reduced by 8.3%, p=0.04

Sensitivity analysis: Including Moore et al.


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<td>2/19</td>
<td>20.45</td>
<td>0.14 [0.01, 2.38]</td>
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<tr>
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<td>1/25</td>
<td>10.54</td>
<td>0.12 [0.00, 6.31]</td>
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<tr>
<td>Moore 1996 (16%ltf)</td>
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<td>2/31</td>
<td>30.64</td>
<td>0.49 [0.05, 4.85]</td>
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<td>38.37</td>
<td>0.26 [0.03, 2.06]</td>
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<td>Total (95% CI)</td>
<td>97</td>
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<td>0.26 [0.07, 0.93]</td>
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Total events: 2 (Early EN (<24 h)), 8 (Standard Care)

Test for heterogeneity: Chi² = 0.59, df = 3 (P = 0.90), I² = 0%

Test for overall effect: Z = 2.08 (P = 0.04)

Mortality reduced by 6.7%, p=0.04
Early EN in trauma: Direct evidence

- Early EN also resulted in:
  - Reduced incidence of pneumonia (33% eEN vs 64%, p=0.050)
  - A trend towards a reduction in the severity of MODS (2.5 vs 3.1 organ failures per patient, p=0.057)

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There were no signs of any harms.

Early EN in Upper GI Sx: Indirect evidence
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- A Meta-analysis comparing RCT’s of early feeding (within 24h) versus no feeding in patients undergoing gastrointestinal surgery.
- 13 studies, 1,173 patients

A Meta-analysis comparing RCT’s of early feeding (within 24h) versus no feeding in patients undergoing gastrointestinal surgery.

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- Early feeding resulted in a significant decrease in:
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13 studies, 1,173 patients

Early feeding resulted in a significant decrease in:

- Mortality (2.4% eEN vs 6.9%, p=0.03)

Early feeding was not associated with any harms:

- Wound infections (7.1% eEN vs 9.3%, p=0.26)
- Anastomotic dehiscence (2.8% eEN vs 4.3%, p=0.27)
- Pneumonia (2.3% eEN vs 3.3%, p=0.46)

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- Pneumonia (2.3% eEN vs 3.3%, p=0.46)

“There is no obvious benefit for keeping patients “nil by mouth” after gastrointestinal surgery”

A special case: The Open Abdomen

“deliberately leaving a laparotomy wound open is now the standard of care in clinical situations that require either planned reoperations or decompression of intra-abdominal hypertension”

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- **Planned re-operation:** Damage control surgery or management of severe abdominal infection
- **Decompression of intra-abdominal hypertension:** Repair of a ruptured abdominal aortic aneurysm or decompressive laparotomy for abdominal compartment syndrome
- **Less commonly:** septic dehiscence of a laparotomy incision or partial loss of the abdominal wall prohibit definitive closure, resulting in an open abdomen

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Fear of inducing small bowel necrosis by stressing an underperfused bowel.

Fear of increasing bowel distension, making it harder for the surgeon to obtain fascial closure.

Feeding the Open Abdomen: Dogma?

- Fear of bowel oedema and ileus, with subsequent aspiration pneumonia.
- Fear of inducing small bowel necrosis by stressing an underperfused bowel.
- Fear of increasing bowel distension, making it harder for the surgeon to obtain fascial closure.

Therefore many open abdomen patients receive no nutrition until fascial closure.

Should we fear enteral nutrition?
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- average age 38, 77% male
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39% (232/597) received EN before first attempt at closure of the abdomen

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Receiving EN before first attempt at closure resulted in significant improvements in outcome.

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There were no reported adverse events with the use of EN started prior to fascial closure


Physiology: Why should patients benefit?

Trauma, including isolated head trauma, triggers a hypermetabolic and catabolic state, severely impairing nitrogen (protein) balance.

Characterized by disproportional pro-inflammatory cytokine production (e.g., tumor necrosis factor-α, interleukin-1 and interleukin-6) and release that is associated with increased counter-regulatory hormones (e.g., cortisol, glucagon and catecholamines) release.

This process leads to increased nutrient needs, which begins early and may persist throughout recovery and rehabilitation.
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- Reduced contractility promotes bacterial overgrowth.
- Gut stasis, bacterial overgrowth and loss of structural integrity leads to bacterial translocation (*even more* bacterial cross intestinal barrier!!!).
- Gut neutrophils become ‘primed’ and release cytokines into lymphatic drainage and also may travel to distant sites
  - Increases overall oxidative stress, predisposing to infection and MODs

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Role of Parenteral Nutrition

- Patients with contraindications to early EN may benefit from early PN.
- PN does not increase infectious complications.


Questions?

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Key papers

- Demonstrates strength of acceptance of the importance of early feeding by trauma surgeons.

- Extensive search and systematic review of best available evidence for early EN in trauma.

- Major multi-centre observational study demonstrating patients often assumed to be ‘most difficult to feed’ benefit from early EN.

- Major RCT demonstrating PN does NOT increase infections and improves patient outcomes.