#### Benchmarking your ICU's feeding performance: How early is early?

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- Review major ICU nutrition guidelines.
- Review the evidence behind the guidelines.
- Understand current practice.
- Summary.



Five major clinical practice guidelines recommend *early* EN.



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#### Evidence for EN < 24 h

Intensive Care Med (2009) 35:2018–2027 DOI 10.1007/s00134-009-1664-4

#### SYSTEMATIC REVIEW

Gordon S. Doig Philippa T. Heighes Fiona Simpson Elizabeth A. Sweetman Andrew R. Davies Early enteral nutrition, provided within 24 h of injury or intensive care unit admission, significantly reduces mortality in critically ill patients: a meta-analysis of randomised controlled trials



#### Comprehensive Literature search

- MEDLINE (http://www.PubMed.org) and EMBASE (http://www.EMBASE.com)
- Academic and industry experts were contacted,
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Primary analysis

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#### Primary outcome

clinically meaningful patient oriented outcomes: (mortality / physical function / quality of life)



# 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

Review:Early EN (<24h) vs Control (Primary Analysis)</th>Comparison:01 early EN vs ControlOutcome:01 Mortality, Intention to treat analysis

| Study<br>or sub-category  | early EN (<24 h)<br>n/N | Control<br>n/N | OR (fixed)<br>95% Cl                  | Weight<br>%     | OR (fixed)<br>95% Cl                   |  |
|---|-------------------------|----------------|---------------------------------------|-----------------|--|--|
| Chiarelli 1990<br>Kompan 1999   | 0/10<br>0/17            | 0/10<br>2/19   | <b>←</b>                              | 13.40           | Not estimable<br>0.20 [0.01, 4.47]     |  |
| Kompan 2004<br>Nguyen 2008  | 0/27<br>6/14            | 1/25<br>6/14   |                                       | 8.89<br>        | 0.30 [0.01, 7.63]<br>1.00 [0.22, 4.47] |  |
| Chuntrasakul 1996<br>Pupelis 2001   | 1/21<br>1/30            | 3/17<br>7/30   |                                       | 18.38<br>39.38  | 0.23 [0.02, 2.48]<br>0.11 [0.01, 0.99] |  |
| Total (95% CI)  | 119                     | 115            |                                       | 100.00          | 0.34 [0.14, 0.85]                      |  |
| Total events: 8 (early EN (<24 h)), 19 (Control)<br>Test for heterogeneity: Chi <sup>2</sup> = 3.20, df = 4 (P = 0.52), l <sup>2</sup> = 0%<br>Test for overall effect: Z = 2.31 (P = 0.02) |                         |                |                                       |                 |  |  |
|   |                         |                | 0.1 0.2 0.5 1 2<br>Favours EN Favours | 5 10<br>Control |  |  |

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



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

| Review:<br>Comparison:<br>Outcome:  | Comparison: 01 early EN vs Control |                |  |  |                 |  |                |  |  |
|---|------------------------------------|----------------|--|--|-----------------|--|----------------|--|--|
| Study<br>or sub-category  | early EN (<24 h)<br>n/N            | Control<br>n/N |  |  | (fixed)<br>% Cl |  | Weight<br>%    | OR (fixed)<br>95% Cl                   |  |
| Kompan 2004<br>Nguyen 2008  | 9/27<br>3/14                       | 16/25<br>6/14  |  |  | -               |  | 70.15<br>29.85 | 0.28 [0.09, 0.88]<br>0.36 [0.07, 1.91] |  |
| Total (95% Cl)       41       39       100.00       0.31 $[0.12, 0.78]$ Total events: 12 (early EN (<24 h)), 22 (Control) |                                    |                |  |  |                 |  |                |  |  |
| 0.01 0.1 1 10 100<br>Favours treatment Favours control  |                                    |                |  |  |                 |  |                |  |  |

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



#### Evidence for EN < 48 h

JPEN J Parenter Enteral Nutr. 2003 Sep-Oct;27(5):355-73.

Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients.

Heyland DK<sup>1</sup>, Dhaliwal R, Drover JW, Gramlich L, Dodek P; Canadian Critical Care Clinical Practice Guidelines Committee.

#### Author information

#### Abstract

**OBJECTIVE:** This study was conducted to develop evidence-based clinical practice guidelines for nutrition support (ie, enteral and parenteral nutrition) in mechanically ventilated critically ill adults.

**OPTIONS:** The following interventions were systematically reviewed for inclusion in the guidelines: enteral nutrition (EN) versus parenteral nutrition (PN), early versus late EN, dose of EN, composition of EN (protein, carbohydrates, lipids, immune-enhancing additives), strategies to optimize delivery of EN and minimize risks (ie, rate of advancement, checking residuals, use of bedside algorithms, motility agents, small bowel versus gastric feedings, elevation of the head of the bed, closed delivery systems, probiotics, bolus administration), enteral nutrition in combination with supplemental PN, use of PN versus standard care in patients with an intact gastrointestinal tract, dose of PN and composition of PN (protein, carbohydrates, IV lipids, additives, vitamins, trace elements, immune enhancing substances), and the use of intensive insulin therapy.

Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P. Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. *JPEN* 2003;27(5):355-373.



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Primary analysis

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#### Primary outcome

clinically meaningful patient oriented outcomes: (mortality / physical function / quality of life)



Review:Heyland Early ENComparison:01 MortalityOutcome:01 Mortality

| Study<br>or sub-category  | Early EN (<60 h)<br>n/N   | Control<br>n/N | RR (random)<br>95% Cl | Weight<br>% | RR (random)<br>95% Cl |  |
|---|---|----------------|-----------------------|-------------|-----------------------|--|
| Chiarelli   | 0/10  | 0/10           |                       |             | Not estimable         |  |
| Chuntrasakul  | 1/21  | 3/17           |                       | 11.14       | 0.27 [0.03, 2.37]     |  |
| Eyer  | 2/19  | 2/19           |                       | 15.27       | 1.00 [0.16, 6.38]     |  |
| Kompan  | 0/14  | 1/14           | <b>_</b>              | 5.39        | 0.33 [0.01, 7.55]     |  |
| Minard  | 1/12  | 4/15           | <b>_</b>              | 12.42       | 0.31 [0.04, 2.44]     |  |
| Moore   | 1/32  | 2/31           |                       | 9.51        | 0.48 [0.05, 5.07]     |  |
| Pupelis   | 1/30  | 7/30           | <b>_</b>              | 12.70       | 0.14 [0.02, 1.09]     |  |
| Singh   | 4/21  | 4/22           | _ <b>+</b> _          | 33.57       | 1.05 [0.30, 3.66]     |  |
| Total (95% CI)<br>Total events: 10 (Early EI<br>Test for beterogeneity: C | 159<br>N (<60 h)), 23 (Control)<br>Chi² = 4.05, df = 6 (P = 0.67), l² = 0 | 158            | •                     | 100.00      | 0.52 [0.25, 1.08]     |  |
| Test for overall effect: $Z = 1.76$ (P = 0.08)                            |   |                |                       |             |                       |  |
|   |   | 0              | .01 0.1 1 10          | 100         |                       |  |
| Favours treatment Favours control   |   |                |                       |             |                       |  |

Heyland DK, Dhaliwal R, Drover JW, Gramlich L, Dodek P. Canadian clinical practice guidelines for nutrition support in mechanically ventilated, critically ill adult patients. *JPEN* 2003;27(5):355-373.



Review:Heyland Early ENComparison:01 MortalityOutcome:01 Mortality

| Study<br>or sub-category                     | Early EN (<60 h)<br>n/N                   | Control<br>n/N | RR (random)<br>95% Cl | Weight<br>% | RR (random)<br>95% Cl |  |
|--|---|----------------|-----------------------|-------------|-----------------------|--|
| Chiarelli                                    | 0/10                                      | 0/10           |                       |             | Not estimable         |  |
| Chuntrasakul                                 | 1/21                                      | 3/17           | <b>_</b>              | 11.14       | 0.27 [0.03, 2.37]     |  |
| Eyer   | 2/19                                      | 2/19           |                       | 15.27       | 1.00 [0.16, 6.38]     |  |
| Kompan                                       | 0/14                                      | 1/14           |                       | 5.39        | 0.33 [0.01, 7.55]     |  |
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| Pupelis                                      | 1/30                                      | 7/30           | <b>_</b>              | 12.70       | 0.14 [0.02, 1.09]     |  |
| Singh  | 4/21                                      | 4/22           | _ <b>+</b> _          | 33.57       | 1.05 [0.30, 3.66]     |  |
| Total (95% CI)<br>Total events: 10 (Early EN |   | 158            |                       | 100.00      | 0.52 [0.25, 1.08]     |  |
|  | $hi^2 = 4.05, df = 6 (P = 0.67), I^2 = 0$ | )%             |                       |             |                       |  |
| Test for overall effect: Z =                 | 1.76 (P = 0.08)                           |                |                       |             |                       |  |
|  |   | 0              | .01 0.1 1 10          | 100         |                       |  |
| Favours treatment Favours control            |   |                |                       |             |                       |  |

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

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Significant evidence. Significant evidence. Significant evidence.

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Evidence of trend. Significant evidence. Significant evidence. Significant evidence. Evidence of trend.

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  - *Active implementation:* Education, posters, audit and feedback, reminders
  - 65.1% of patients who received EN were started within 24 h

Heyland DK, Heyland RD, Cahill NE, Dhaliwal R, Day AG, Jiang X, Morrison S, Davies AR. Creating a culture of clinical excellence in critical care nutrition: the 2008 "Best of the Best" award. *JPEN* 2010 Nov-Dec;34(6):707-15.

Doig GS. Nutrition Guidelines: Do we need them? 31<sup>st</sup> Australian and New Zealand Annual Scientific Meeting on Intensive Care, Hobart, October 12-15, 2006.

Doig GS, Simpson F, Finfer S, et al. Effect of evidence-based feeding guidelines on mortality of critically ill patients: a cluster randomized controlled trial. *JAMA* 2008 Dec 17;300(23):2731-41.



The evidence supporting patient benefits from the provision of Early EN is robust

- meta-analyses demonstrate early EN improves survival
- 3 out of 5 major guidelines recommend commencing EN within 24 h
- the remaining 2 major guidelines recommend commencing EN within 24 to 48 h



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How is your ICU performing?



### We would like to invite you to participate:

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### 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.

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• A Global audit of time from ICU admission to commencing nutrition therapy.



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How is your ICU performing?

- A Global audit of time from ICU admission to commencing nutrition therapy.
- Very simple data collection.



|  |  |  |  |                 |                       | How is your ICU performing?   |   |  |
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### **Hospital Name Here** ICU Nutrition Audit Home Page

Welcome to your hospital's secure data submission and feedback page for the ICU Nutrition Audit Project. Choose a link from below:

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### ICU Nutrition Audit Data Submission Form

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#### @ 2012 Gordon S. Doig Design, layout and images by John Soer and Gordon Doig. Page last modified on Thursday 19 July 2012

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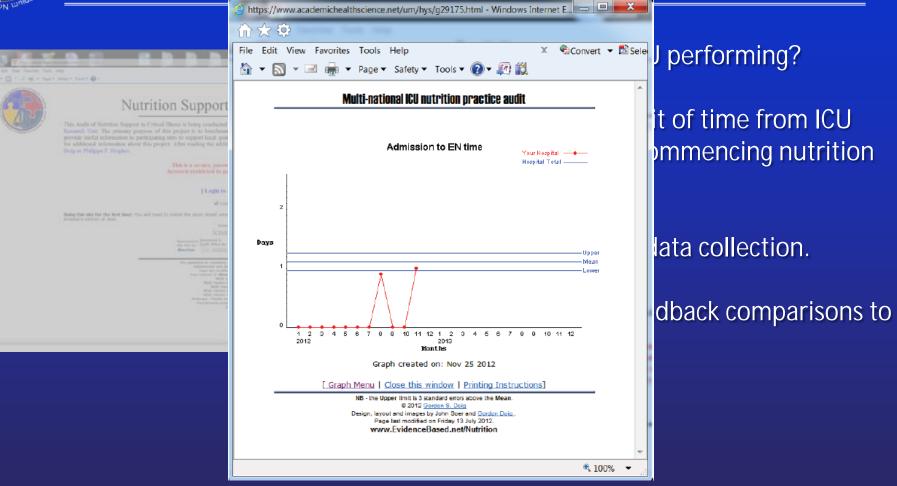


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• If your data suggests you could improve practice, Phase II of the project will help you improve by providing you with a comprehensive change management strategy to focus on the aspect of nutrition therapy that needs change.



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• No costs involved (to you or your hospital).



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### Nutrition Support in Critical Illness



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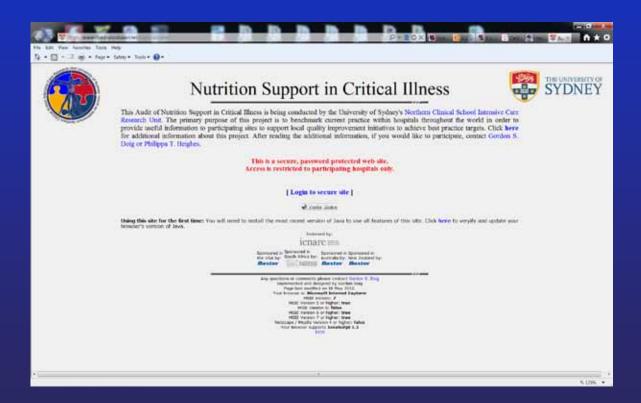


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### Questions?

### www.EvidenceBased.net/Nutrition









## Immediately after resuscitation:

Stable shock can be defined as:

Shock Index ≤ 1 (heart rate ÷ systolic blood pressure = Shock Index)

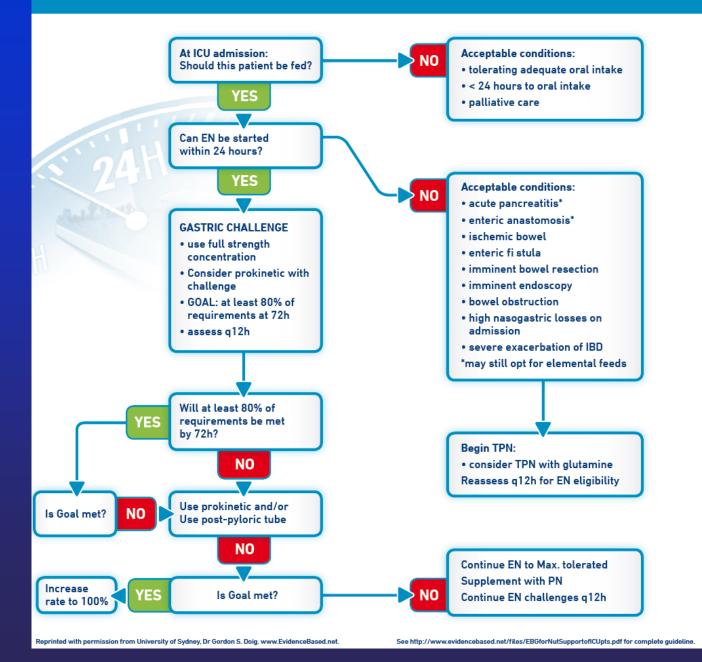
or

Systolic blood pressure > 90 mmHg or mean blood pressure > 70 mmHg for at least one hour.

Doig GS and Heighes PT. A Change Management Perspective on a Novel Meta-Analysis: Early Enteral Nutrition in Trauma Patients. *ICU Management Forum*, 2011;11(3):26-29.



### Evidence-based ICU feeding algorithm

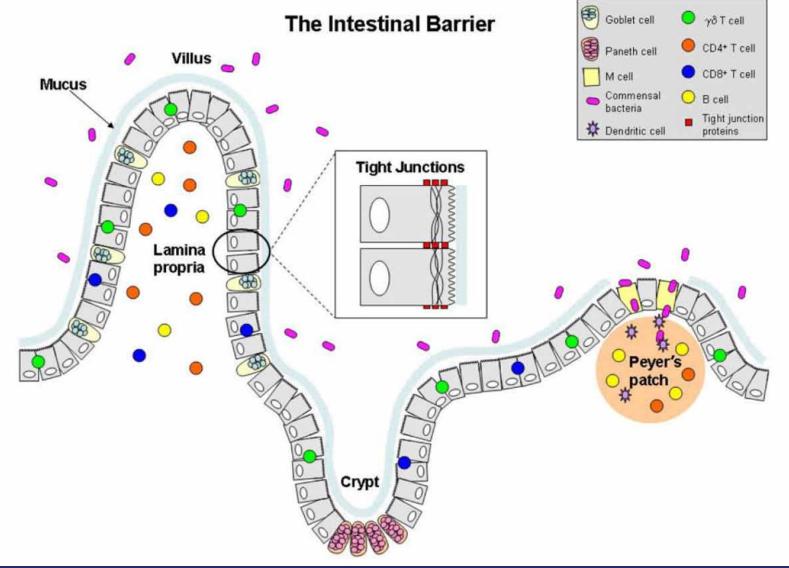




## *How was early (< 24 h) EN initiation achieved?*

| Study                | Patient population   | Early EN intervention   |
|----------------------|--|---|
| Chiarelli<br>1990    | Thermal injury (25% to<br>60% TBSA). No<br>inhalational injury.<br>Mean survival probability<br>0.73±0.10. | <b>Immediately after admission: 50 ml/h</b> 'homemade' EN (1900kcal/L and 79 g protein/L) via NGT increasing over 3-4 days. Goals set with <b>Curreri formula</b> . Rate did not exceed 150 ml/h.   |
| Chuntrasakul<br>1996 | Trauma (ISS > 20 and <<br>40).<br>Mean ISS 29±1.5  | Immediately after resuscitation or surgery: 30 mls/h ¾-<br>strength EN (Traumacal <sup>™</sup> ) via NGT, concentration increased<br>over time. Goals estimated using modified Harris-Benedict<br>equation. TPN was added if goals were not met.  |
| Kompan<br>1999       | Trauma (ISS > 25)<br>Mean ISS 33.6±10<br>Mean APACHE II<br>11.5±5.8  | Immediately after resuscitation: EN (Jevity <sup>™</sup> ) started at 20<br>ml/h via NGT. Increased to 50% of estimated goal on Day 1,<br>75% of estimated goal on Day 2 and 100% of goal on Day 3.<br>Estimated goal was set at 25-35 nonprotein kcal/kg per day<br>and 0.2 – 0.3 g nitrogen / kg per day at 72 hours post ICU<br>admission. TPN was added to meet estimated requirements. |
| Pupelis<br>2001      | Severe pancreatitis and<br>peritonitis<br>Mean APACHE II<br>11.5±5.4                                       | Within 12 h of surgery: EN (Nutrison Standard <sup>™</sup> or Nutrison<br>Pepti <sup>™</sup> ) via NJT started at 20-25ml/h. Increase based in<br>individual tolerance to 1 L per day by Day 3 post-op. Patients<br>also received an average of 500kcals/day from IV dextrose.  |
| Kompan<br>2004       | Trauma (ISS > 20).<br>Mean APACHE II<br>11.3±4.8   | Immediately after resuscitation: Same protocol as Kompan 1999 except goal set at an average of 25 nonprotein kcal/kg.   |
| Nguyen<br>2008       | Mechanically ventilated<br>ICU patients<br>APACHE II<br>22.4±1.2   | Within 24 h of admission: EN via NGT at 40 ml/h and<br>increased by 20ml/h q6h to goal, if tolerated (aspirates<br><250mls). Goal was determined by a dietitian, based on<br>patient's BMI.   |





Clark JA and Coopersmith CM. Intestinal crosstalk – a new paradigm for understanding the gut as the "motor" of critical illness. *Shock* 2007;28(4):384-393.



# Multifaceted practice change strategy

- 1) Academic detailing
- 2) Educationally influential opinion leaders
- 3) Local consensus process
  - local champions
- 4) Reminders (manual or computerized)
  - active ongoing bedside reminder system
  - educational materials
- 5) Audit and feedback
  - computer generated, timely
  - should be delivered by peers or opinion leaders
- 6) Educational outreach process
  - didactic lecture based CME (conferences, lectures)
- 7) Unsolicited mail
  - educational materials

Simpson F and Doig GS. The relative effectiveness of practice change interventions in overcoming common barriers to change: A survey of 14 hospitals with experience implementing evidence-based guidelines. *J Eval Clin Pract* 2007;13:709-715.