The Meat and Potatoes of Critical Care Nutrition

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2013 Canadian Clinical Practice Guidelines

www.criticalcarenutrition.com

The NEW ENGLAND JOURNAL of MEDICINE

REVIEW ARTICLE

CRITICAL CARE MEDICINE

Nutrition in the Acute Phase of Critical Illness

Michael P. Casaer, M.D., Ph.D., and Greet Van den Berghe, M.D., Ph.D.

NEJM March 27, 2014

Use of Enteral vs Parenteral Nutrition

- Based on one level 1 and 13 level 2 studies,
- In critically ill patients, strongly recommend the use of enteral nutrition over parenteral nutrition

This is reinforced by numerous (older) nutrition studies done in trauma patients

Early PN: Location, location, location

- Europe: early PN to prevent caloric deficit
- US/Canada: allow hypocaloric EN for one week before starting PN

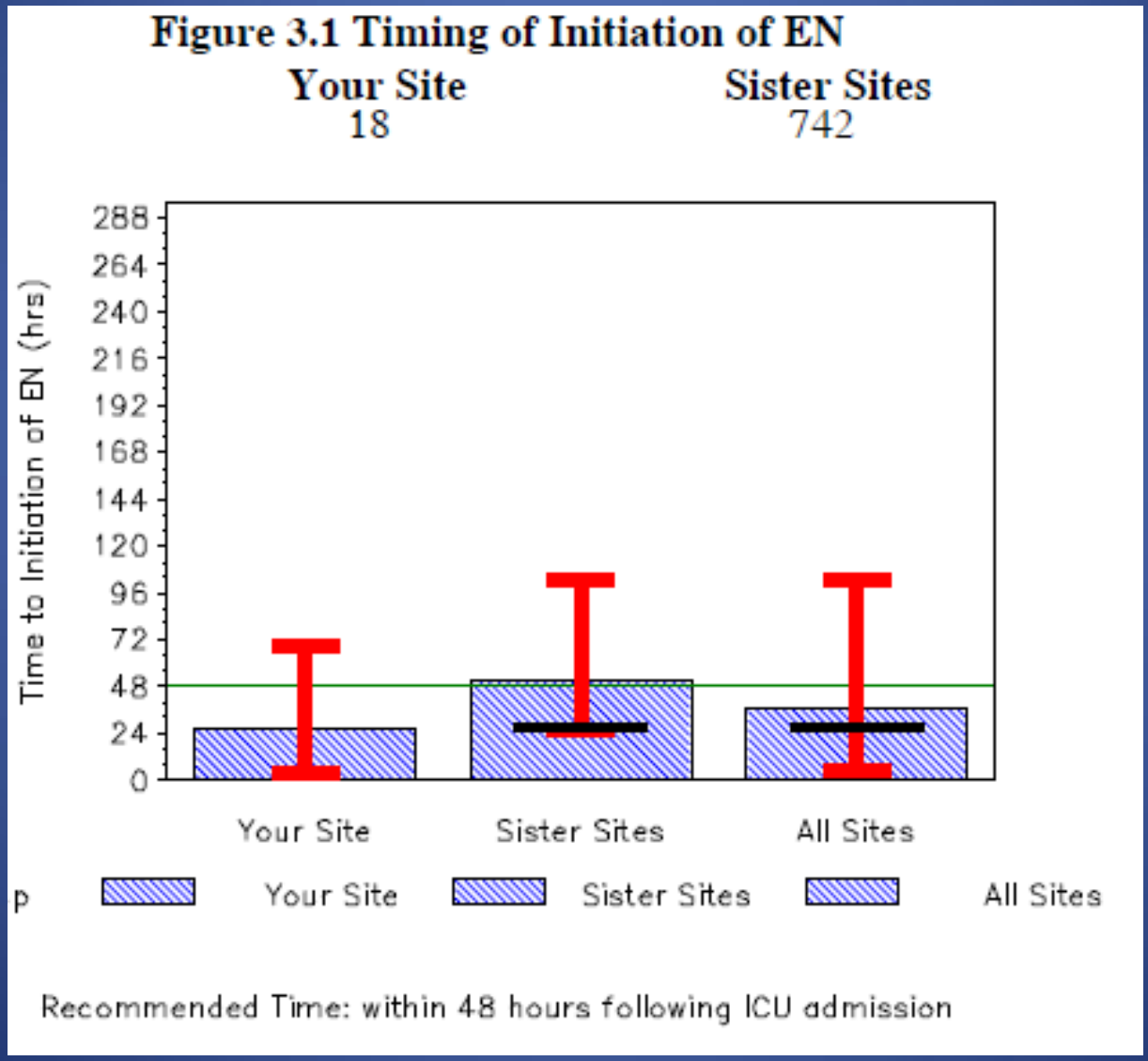
35 yo male S/P MVC underwent ex lap with damage control lap with perihepatic packing. Now 1 day post op, intubated in ICU. There is no ongoing transfusion requirements, BD -2.
When would you start EN??

- A. Now
- B. 48hrs post op
- C. When abdomen closed
- D. Never

Early vs Delayed Nutrition

- Based on 16 level 2 studies
- Recommend early enteral nutrition within 24-48 hours of ICU admission

2013 INS Survey



Quality of Data on Timing of EN?

There are no large high quality randomized trials examining timing

Intentional underfeeding: Trophic vs Full Feeds

- Based on two Level 1 studies in pts with acute lung injury, use of trophic feeds for first 5 days of ICU is NOT recommended

Initial Tropic vs. Full EN in Patients with Acute Lung Injury

Rice TW, et al. *JAMA*. 2012;307(8):795-803

The EDEN randomized trial

Table 2. Clinical Outcomes

Outcome	Trophic Feeding (n = 508)	Full Feeding (n = 492)	*P* Value
Ventilator-free days, No. (95% CI)	14.9 (13.9-15.8)	15.0 (14.1-15.9)	.89
Failure-free days, No. (95% CI)			
Cardiovascular	19.1 (18.2-20.0)	18.9 (18.1-19.8)	.75
Renal	20.0 (19.0-20/9)	19.4 (18.4-20.5)	.43
Hepatic	22.0 (21.2-22.9)	22.6 (21.8-23.5)	.37
Coagulation	22.3 (21.4-23.1)	23.1 (22.3-23.9)	.16
ICU-free days, No. (95% CI)	14.4 (13.5-15.3)	14.7 (13.8-15.6)	.67
60-d mortality, No. (%) [95% CI]	118 (23.2) [19.6-26.9]	109 (22.2) [18.5-25.8]	.77
Development of infections, No. (%) [95% CI]			
VAP	37 (7.3) [5.0-9.5]	33 (6.7) [4.5-8.9]	.72
Clostridium difficile colitis	15 (3.0) [1.5-4.4]	13 (2.6) [1.2-4.1]	.77
Bacteremia, No. (%)	59 (11.6) [8.8-14.4]	46 (9.3) [6.8-11.9]	.24

Abbreviations: ICU, intensive care unit; VAP, ventilator-associated pneumonia.

all p>0.05

Initial Tropic vs. Full EN in Patients with Acute Lung Injury

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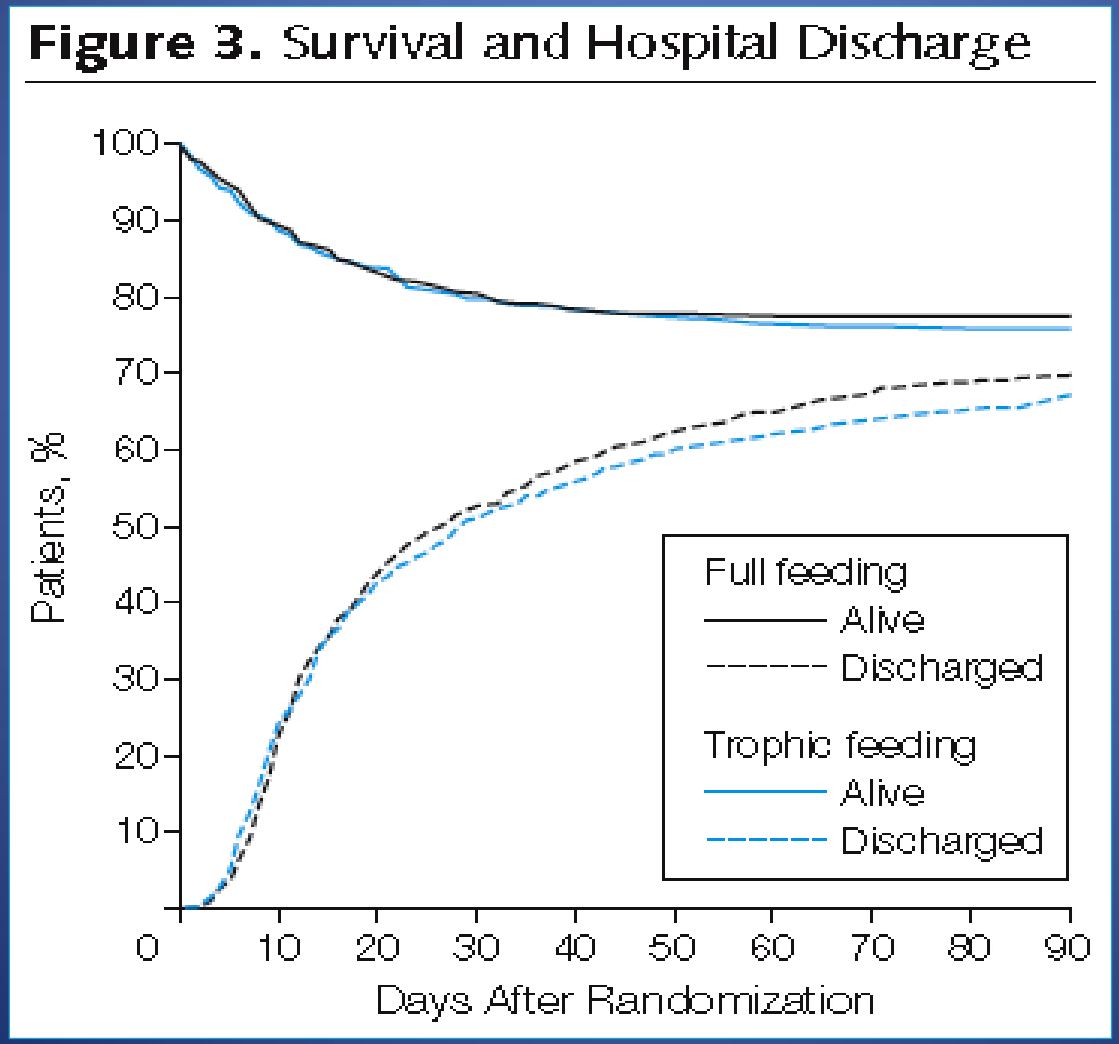
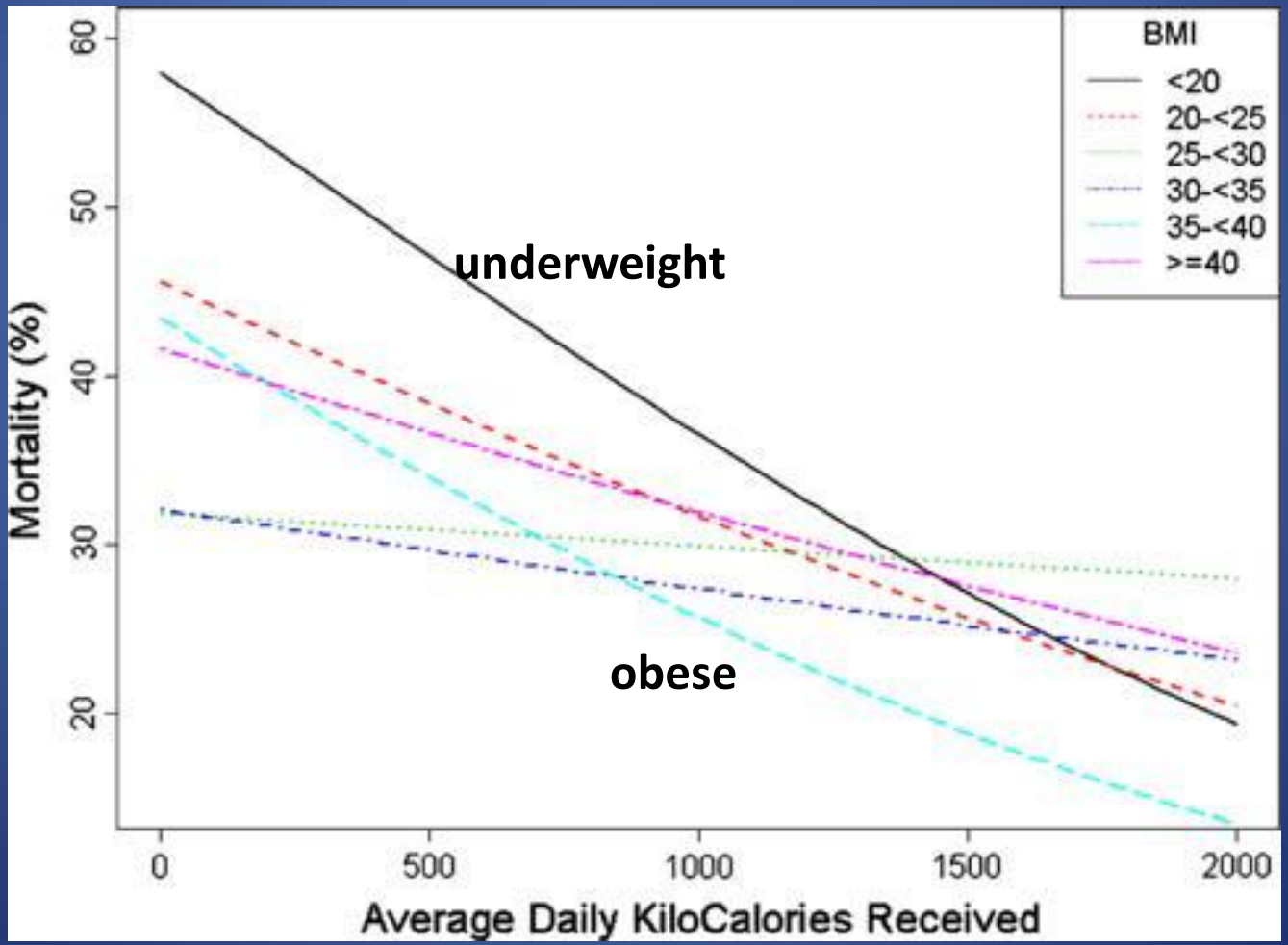


EDEN ???

- 1000 relatively young well-nourished pts
- Maybe not all ICU patients are the same?
- Would high risk trauma patients also do ok if not fed??

The relationship between nutritional intake and clinical outcomes in critically ill patients: results of an international multicenter observational study.

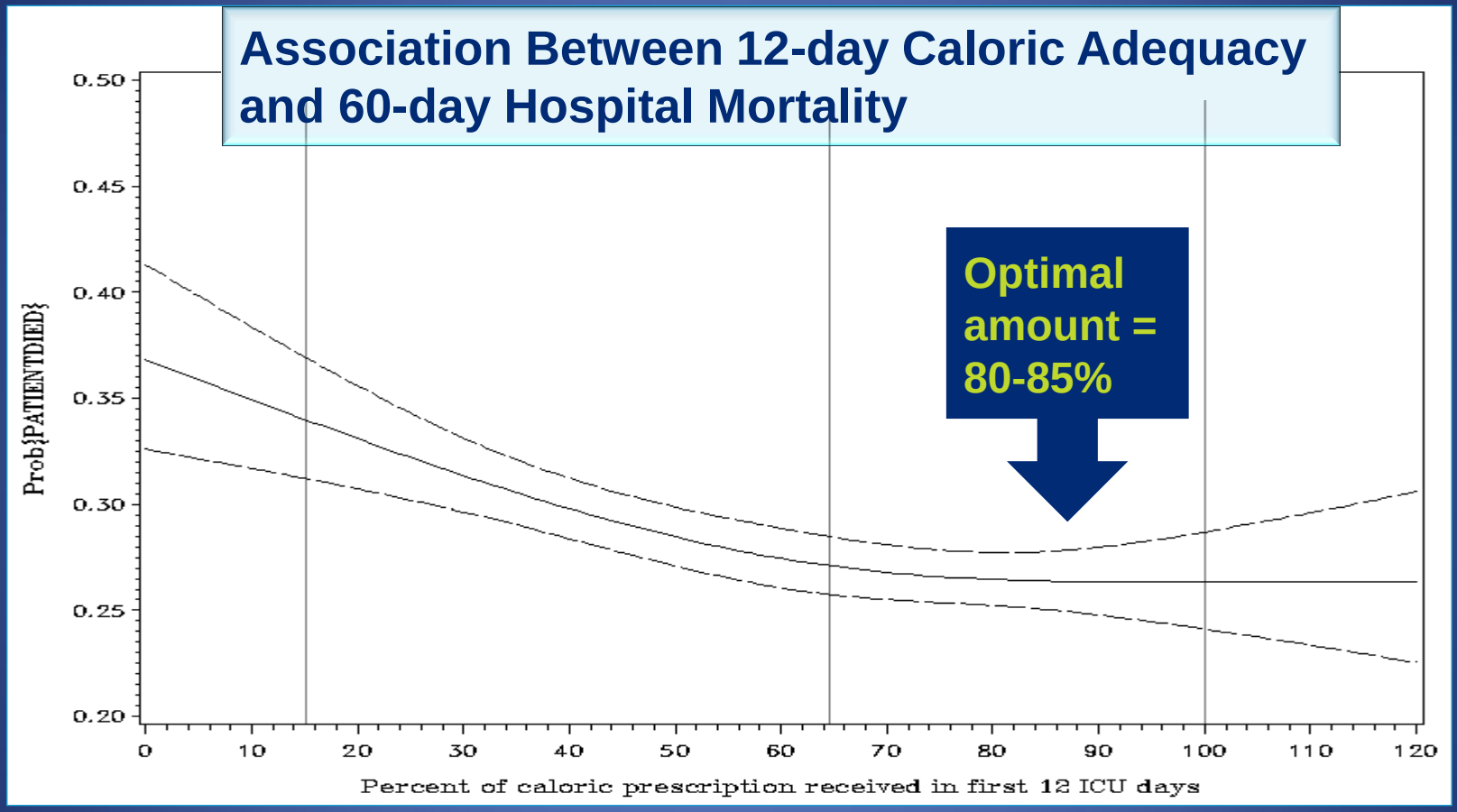
Alberda C et al. Intensive Care Medicine 2009:35.



TOP-UP Study

- Currently underway
- Evaluating the effect of early PN in underweight and obese patients
- Randomized to EN only or EN + PN (use PN only when not at goal EN)
- Using an omega-3 lipid in PN pts

Optimal Amount of Calories for Critically Ill Patients: Depends on how you slice the cake!



Heyland DK, et al. *Crit Care Med*. 2011;39(12):2619-26.

Achieving Target Dose

- To achieve target recommend considering:
  - Starting at target goal
  - Use of pro-motility agents
  - Tolerating higher gastric residual volumes

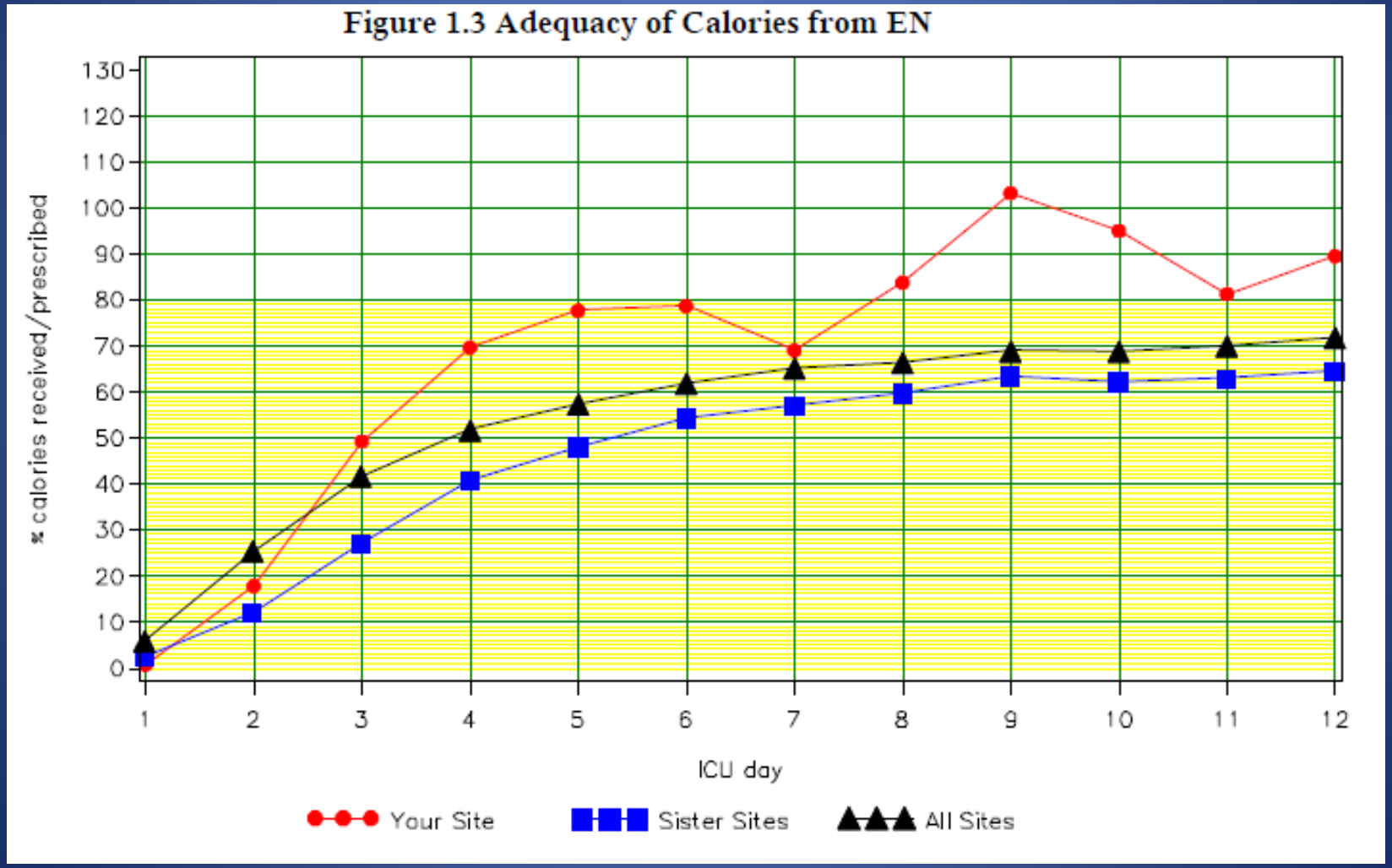
The Efficacy of Enhanced Protein-Energy Provision via the Enteral Route in Critically Ill Patients: The PEP uP Protocol!

- In select patients start the EN at goal rate, not at 25 ml/hr.
- Target a 24 hour volume of EN rather than an hourly rate
- Nurses increase hourly rate to make up the 24 hr volume.
- Start with a semi elemental solution, progress to polymeric.
- Tolerate higher GRV* threshold (300 ml or more).
- Motility agents and protein supplements are started immediately, rather than started when there is a problem.

A major paradigm shift in how we feed enterally

Heyland DK, et al. *Crit Care*. 2010;14(2):R78

2103 INS Survey
193 ICUs (50 US)



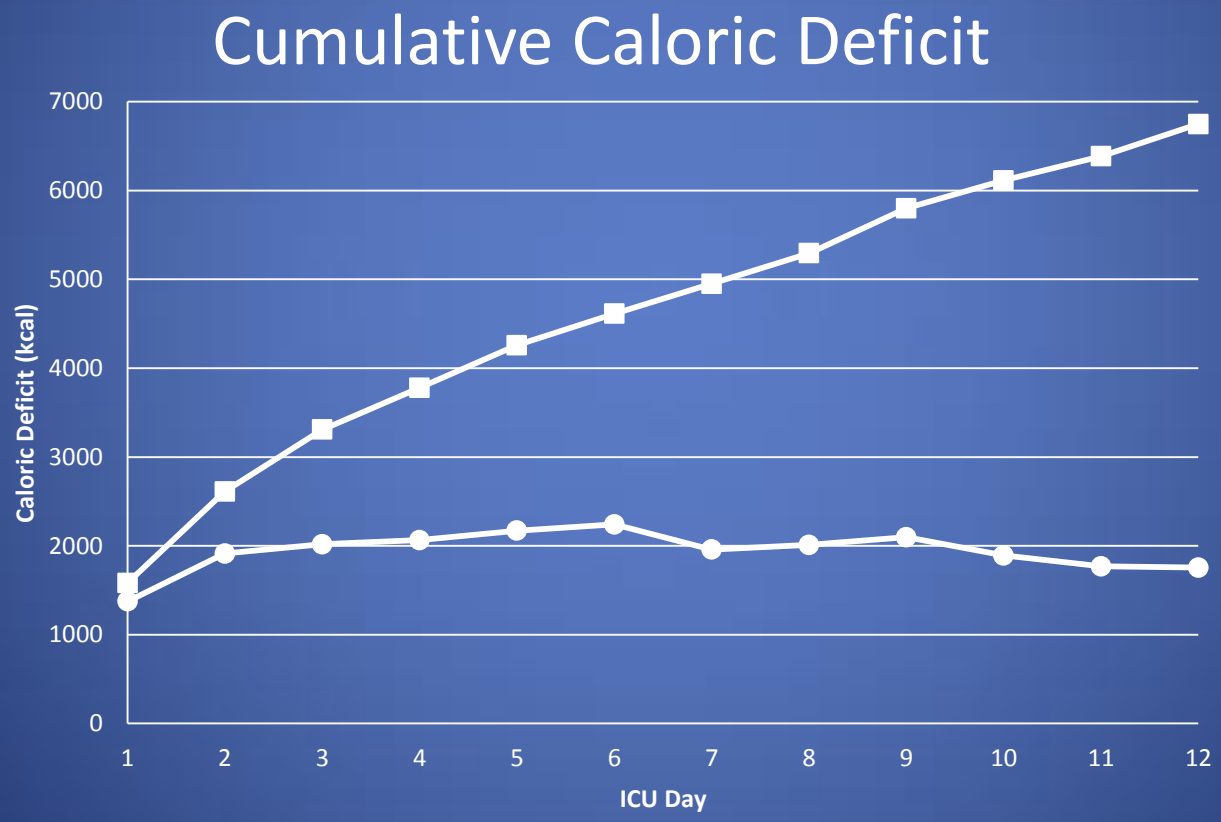
Volume-Based Feeding in the Critically Ill Patient

McClave et al JPEN June 2014

- Single center study volume based to rate based feeding protocol in critically ill
- Volume based feeding pts= 77.6%
- Rate based feeding pts= 61.5%
- Significant increase in goal calories with volume based feeds
- No associated intolerance or aspiration

Physician Driven Catch Up Protocol

Jenny Lee: To be presented at Nutriton Week Feb 15 2015

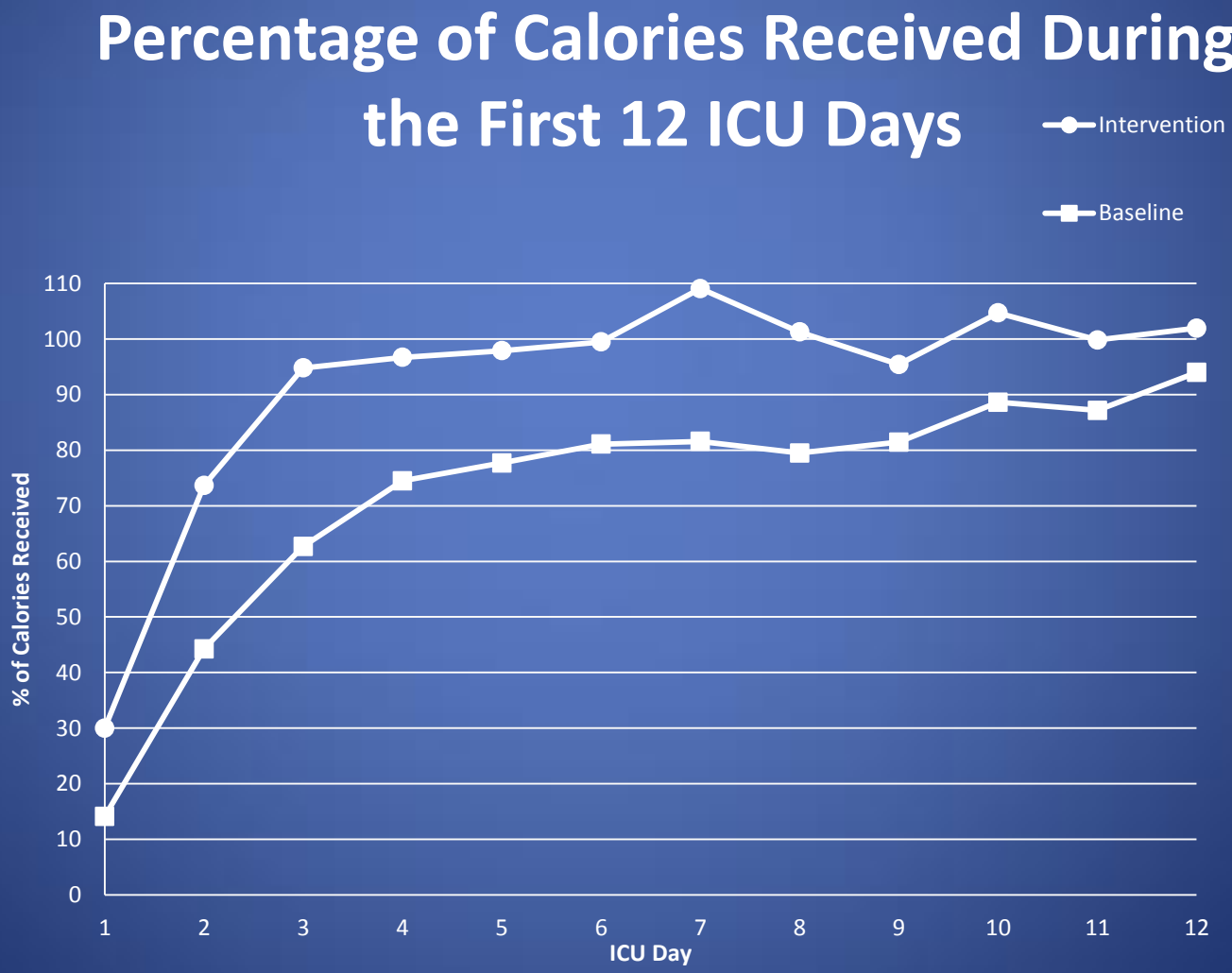


baseline

intervention

Physician Driven Catch Up Protocol

Jenny Lee: To be presented at Nutriton Week Feb 15 2015



Pro-motility Agents

- Recommend metoclopramide over erythromycin
- Consider use with initiation of feeds but start if GRV>250 or intolerance (high GRV or emesis)

Are higher GRV safe?

- **REGANE study** of 329 pts: up to 500 cc safe
- **NUTRIREA** study of 449 pts: not checking GRV did not increase aspiration or related complications.

Montejo JC et al. Intensive Care Med 2010;36:1386

Reignier J et al. JAMA 2013;309:248

Small Bowel Feeds

- Based on 11 level two studies recommend:
- Use of SB feeds if your unit can easily achieve
- If unit logistically more difficult, consider if:
  - high risk intolerance
  - high risk aspiration
- In not feasible, figure out a way if
  - persistent high GRV or intolerance

What are you going to feed?

- 1. **Which formula**
- **2. Added protein**
- **3. Immune enhancing formulas**
- **4. Probiotics**
- **5. Antioxidants**
- **6. Individual pharmaconutrients**

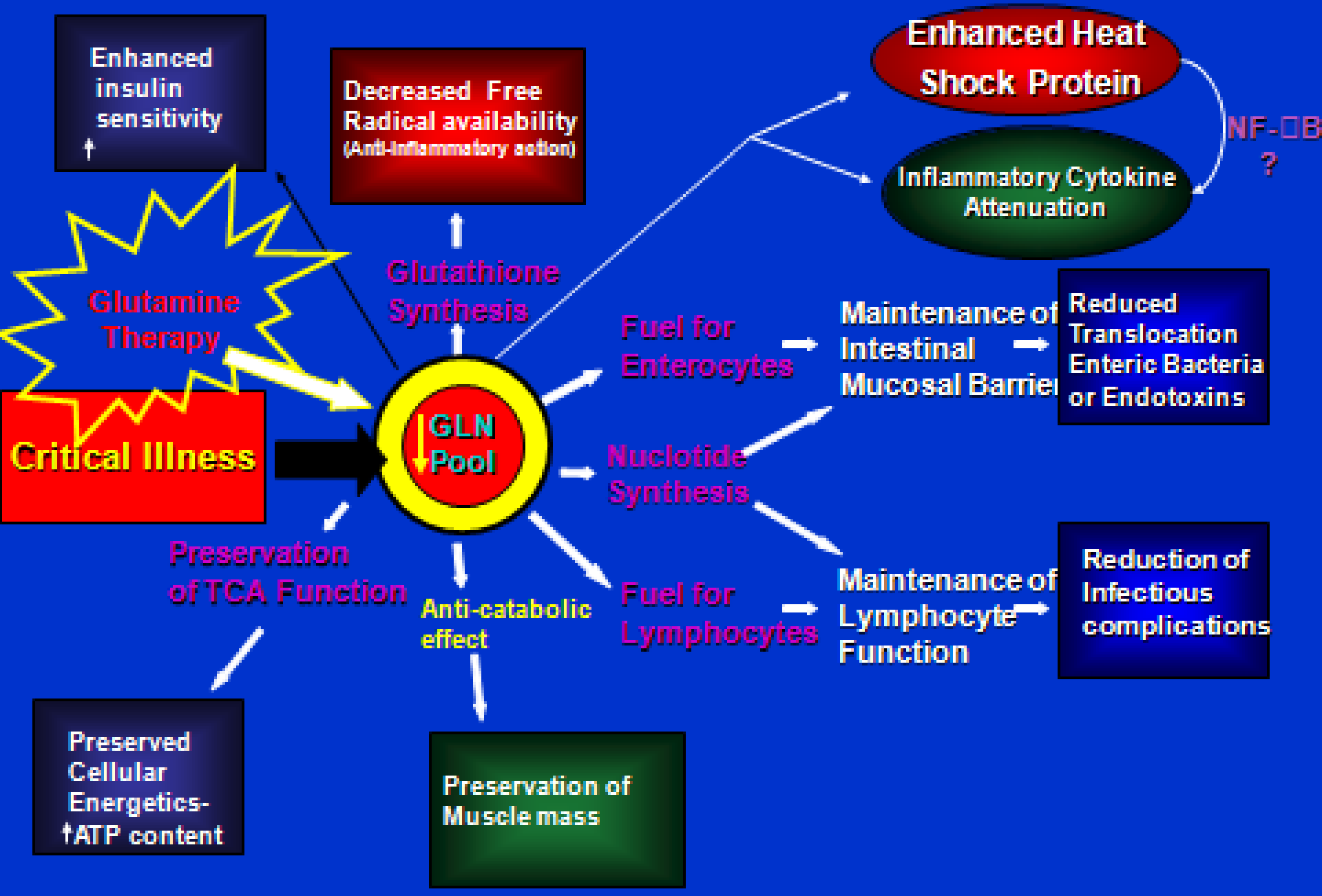
Strategies to Optimize: Probiotics

- Based on three Level 1 and twenty Level 2
- Use of pro-biotics should be considered

Composition of EN: Pharmaconutrients

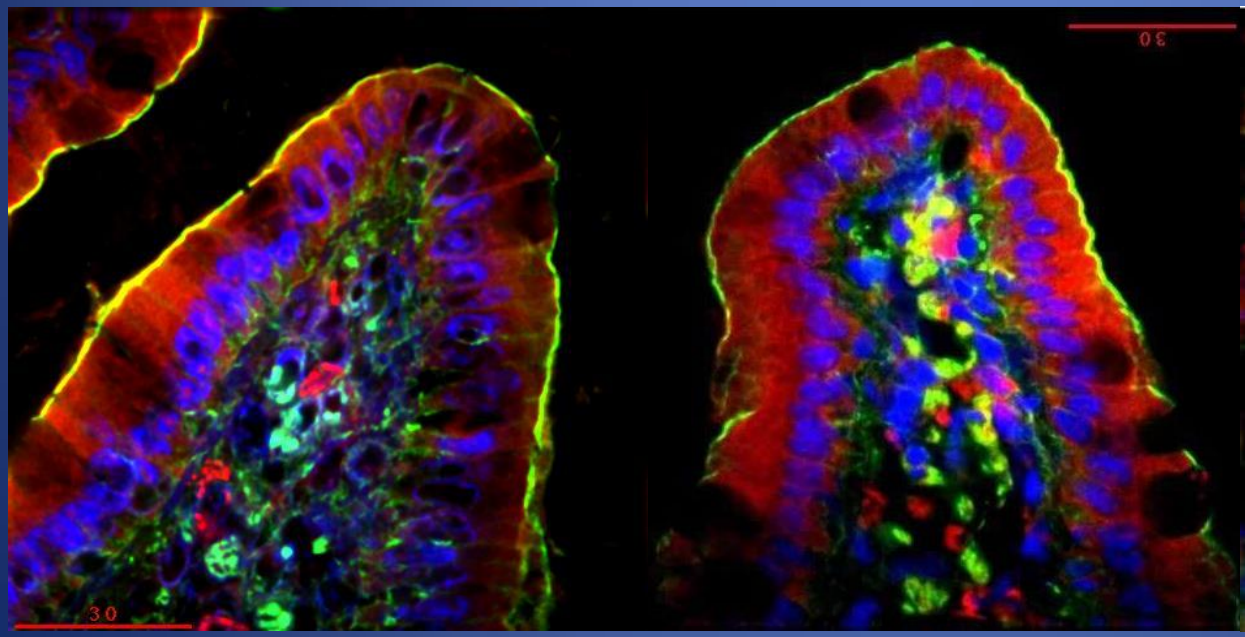
- In general, either insufficient data or data suggesting harm
- For arginine, glutamine, and selenium: not recommended
- Fish oils, antioxidants, or Vitamin D: no benefit or insufficient data

Potential Beneficial Effects of Glutamine



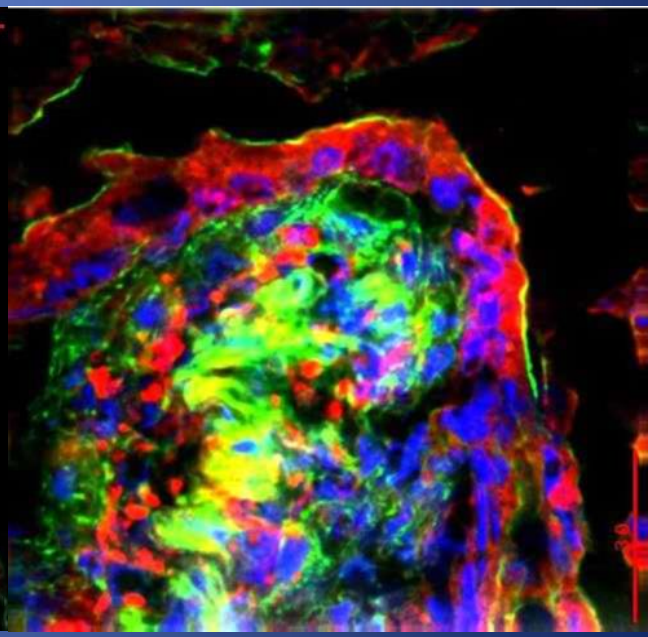
Glutamine is associated with protection in the hypoperfused gut

J Trauma 2004;57



Sham

Glutamine



Arginine

A Randomized Trial of Glutamine and Antioxidants in Critically Ill Patients

Daren Heyland, M.D., John Muscedere, M.D., Paul E. Wischmeyer, M.D., Deborah Cook, M.D., Gwynne Jones, M.D., Martin Albert, M.D., Gunnar Elke, M.D., Mette M. Berger, M.D., Ph.D., and Andrew G. Day, M.Sc., for the Canadian Critical Care Trials Group

In a recent prospective randomized trial in patients with established MODS, parenteral and enteral glutamine supplementation resulted in a nonsignificant trend towards increased mortality.

N Engl J Med 2013 368(16):1489-97

Glutamine and Antioxidants in the Critically Ill Patient: A Post Hoc Analysis of a Large-Scale Randomized Trial

JPEN May 2015

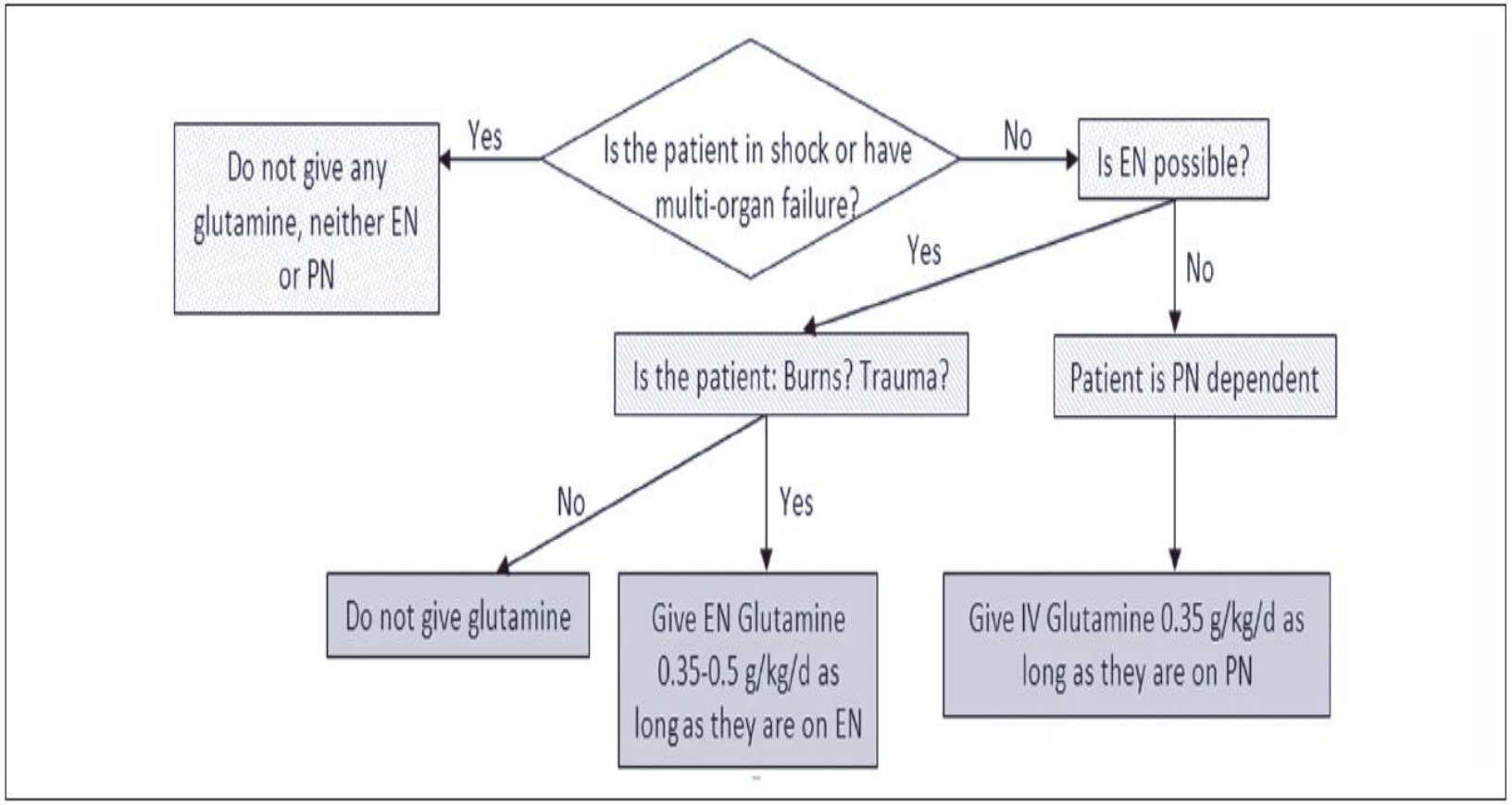


Figure 1. Glutamine Supplementation Algorithm. EN, enteral nutrition; IV, intravenous; PN, parenteral nutrition.

Elderly Trauma Patients

- Many pre-existing malnutrition
- And it's not just nutrition
- Influence of sarcopenia on outcome
- Sarcopenia= low muscle mass

Moisey *et al. Critical Care* 2013, **17**:R206
http://ccforum.com/content/17/5/R206

RESEARCH Open Access

Skeletal muscle predicts ventilator-free days, ICU-free days, and mortality in elderly ICU patients

Lesley L Moisey[1], Marina Mourtzakis[1], Bryan A Cotton[2,3], Tahira Premji[1], Daren K Heyland[4], Charles E Wade[2,3], Eileen Bulger[5] and Rosemary A Kozar[2*], for the Nutrition and Rehabilitation Investigators Consortium (NUTRIC)

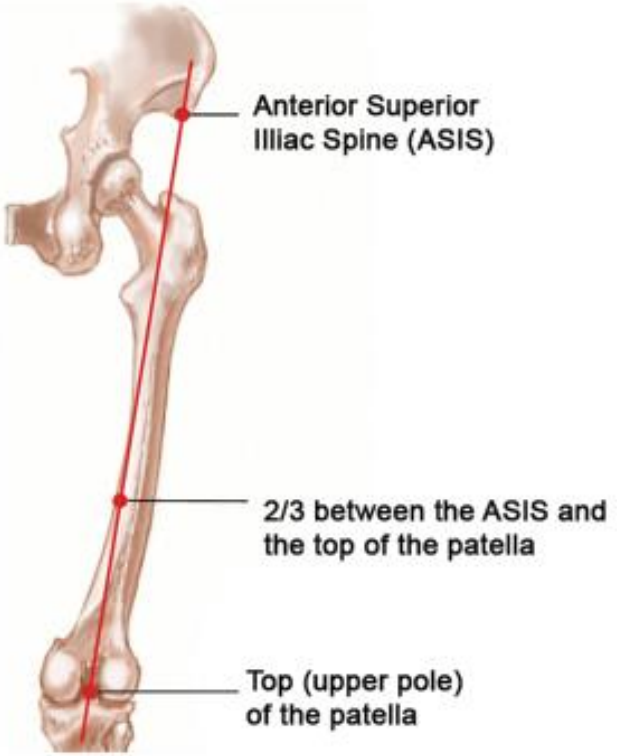
- **Elderly trauma pts (65+) admitted to the ICU**
- **CT scans were used to calculate muscle mass L3**
- **Using validated sex-specific criteria, muscle index was calculated and correlated with outcomes**

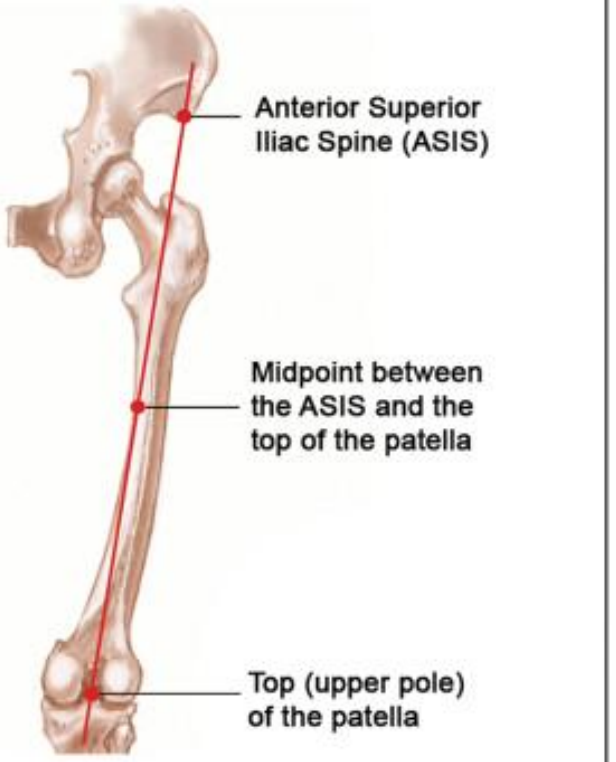
Sarcopenia in the elderly trauma patient

- 71% of elderly sarcopenic
- Of sarcopenic:
  - 9% underweight
  - 44% normal weight
  - 47% overweight/obese
- Multivariate linear regression: sarcopenia but not BMI or albumin, correlated with decreased ventilator and ICU free days

Bedside Ultrasound Is a Practical and Reliable Measurement Tool for Assessing Quadriceps Muscle Layer Thickness

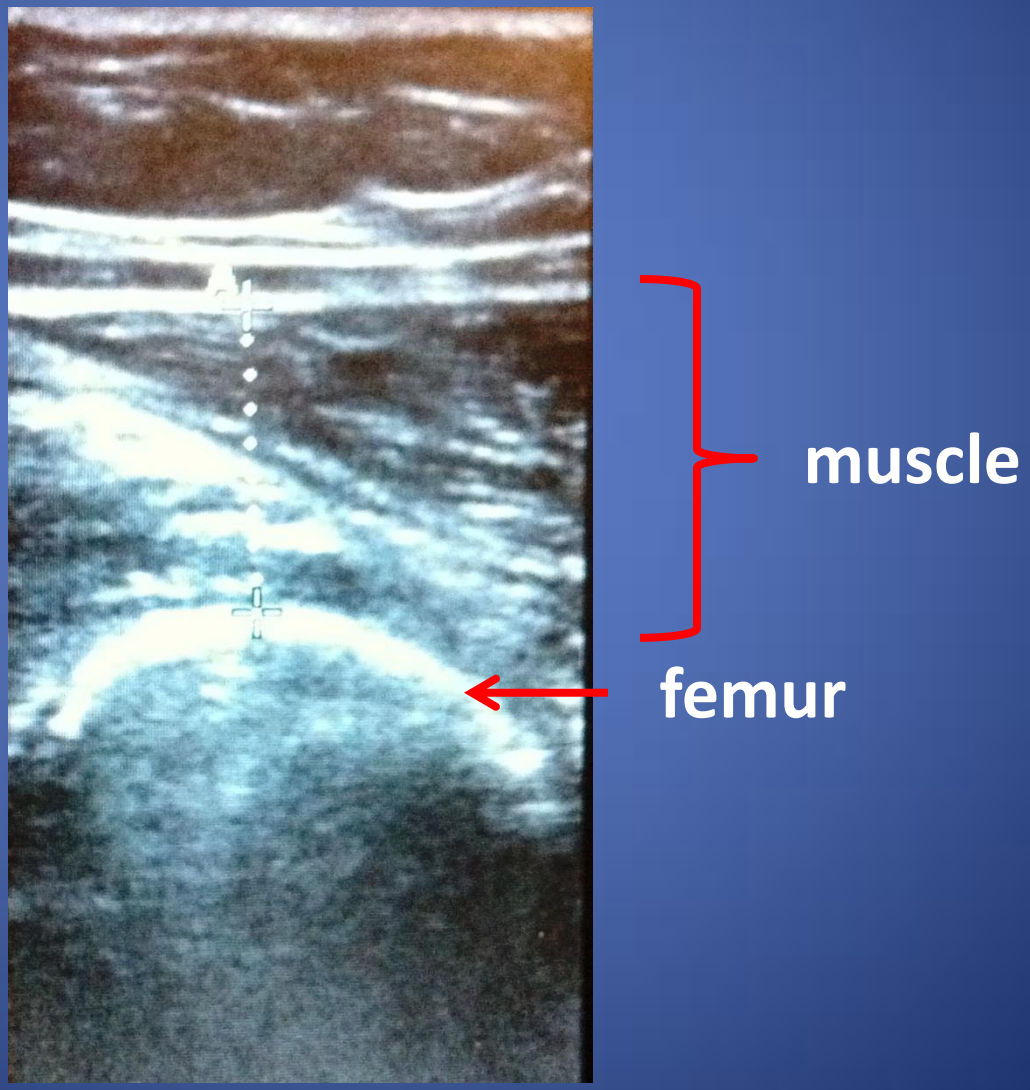
Reading #1	Reading #2
At the border between the lower third and upper two-thirds between ASIS and upper pole of the patella.	At the midpoint between the ASIS and the upper pole of the patella.





Tillquist M et al JPEN 38(7): Sept 2014

Can US be used in place of CT analysis in the evaluation of sarcopenia and muscle loss in the ICU??



What I didn’t cover?

- Feeding the patient on pressors
- Feeding the obese patient
- How to estimate needs?
- Is some tube feeds better than none?

Lots We Don't Know

- Didn't cover influence of exercise/mobility/rehab to the effect of nutrition: need both
- Remember that most nutrition studies are conducted on pts in medical ICU and/or cardiac ICU: different patient populations than trauma
- Effect of nutritional adequacy in trauma ICU patients is needed and does this differ by age, ect
- Happy to answer any ?