Improving Outcomes in Surgery, Trauma and Critical Illness: One Bite at a Time

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Disclosures

- Professor of Surgery and Critical Care U. of Pittsburgh – Leave of Absence
- Medical and Scientific Director – Nestle Health Care Nutrition (Nestle Health Sciences) – North America
- I will not mention or advocate ANY commercial Product
- Nestlé Nutrition Institute

64 year old with Appendicitis

- Female, previously healthy
- March 2011
  - Right lower quadrant pain and urinary tract symptoms.
  - Local hospital – peri-appendiceal abscess
    - Pigtail drain. Sxs. Do not resolve
- June 2011 Continued symptoms
  - Transferred to UPMC - vesico-enteric-cutaneous fistula
  - Colonoscopy – malignancy suspected – bx. adenoma
  - Cystoscopy – tumor eroding into bladder

Why MedicalNutrition Intervention (MNI)?

- It is unavoidable - ALL patients need some form of nutrition
  - Omission – You assume:
    - Patient will do OK on his/her own
    - Nutrition does not make a difference any way
  - Commission – You Know:
    - Your knowledge can guide the patient
    - You can recognize nutrition-related problems
    - You can incorporate Nutrition Intervention akin to other initiatives to provide optimal surgical care

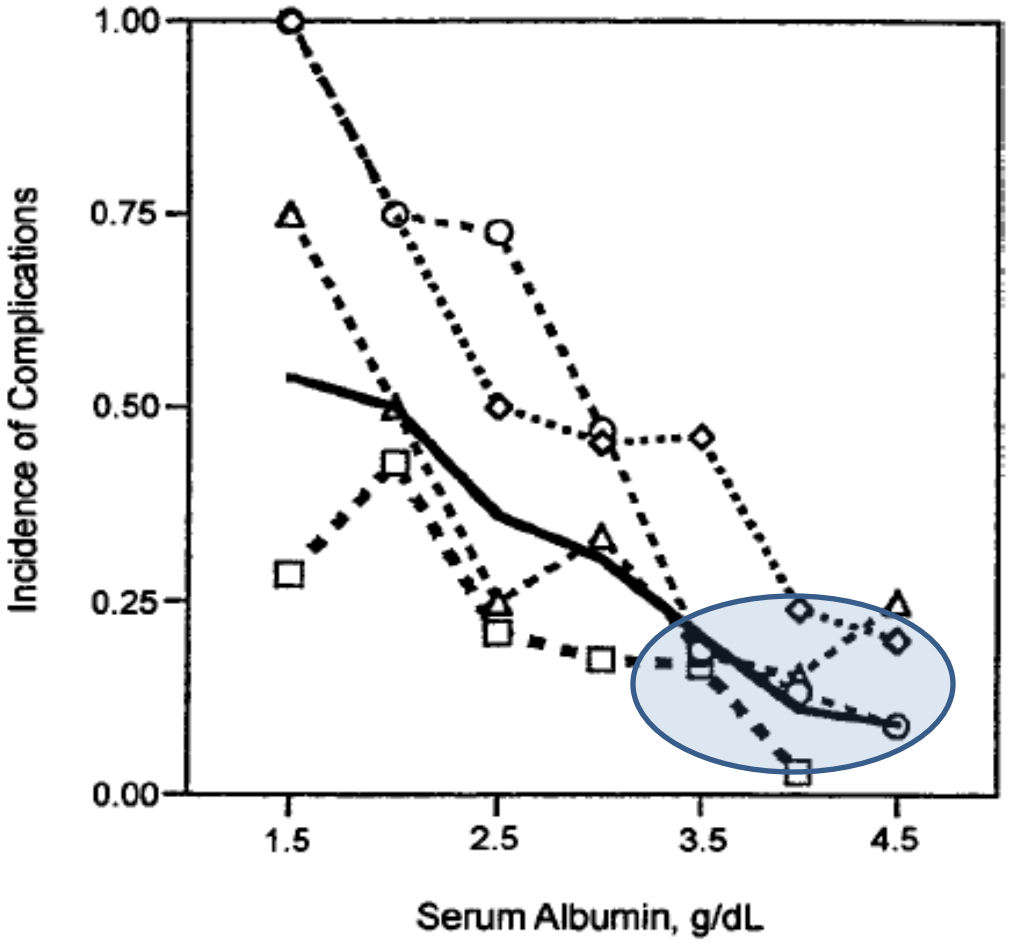
Nutrition intervention must…

- Be easy to implement
  - Require no sophisticated equipment
  - Simple algorithms
  - Incorporated into surgical practice
- Work Neutral
  - Not require more time nor personnel
- Produce a clear benefit
  - Improve clinical outcomes
  - Decrease cost
- How it works (scientific mechanism of action)

64 year old – Adenoca. cecum

- Right hemicolectomy, partial resection bladder, abominal wall, iliac vessels?
- Standard
  - 7- 11 days
  - 38% complication rate HCUP 2006
  - 10-18% infection rate
- Nutrition
  - Patient has a moderate weight loss
  - Albumin levels are normal
  - Significant disruption of oral intake due to:
    - Testing, anorexia, poor palatability of food, anxiety.

Nutrition Status Predicts Surgical Outcome



- Single Most Important Predictor of Outcome
- Affects all Surgical illnesses
- As important as any other evaluation of risk
- Albumin alone establishes prognosis
- Easy to use, cheap

Kudsk KA, Tolley EA, DeWitt RC et al. Preoperative albumin and surgical site identify surgical risk for major postoperative complications. JPEN J Parenter Enteral Nutr 2003; 27:1-9.

Nutrition Intervention

- Nutrition Risk is:
  - Low, intermediate, High
- What type of Intervention?
  - None – patient can tolerate moderate starvation
  - Oral Nutrition supplements
    - Specialized Oral Nutrition Supplements
  - Enteral Nutrition
  - TPN
- Any Risks from Nutrition Intervention
  - Complications
  - Cost
  - Disruption in other care

Heyland Meta-analysis- Immune Enhancing Diets and Infectious Complications

Heyland D. JAMA 2001;(286)8:944-953

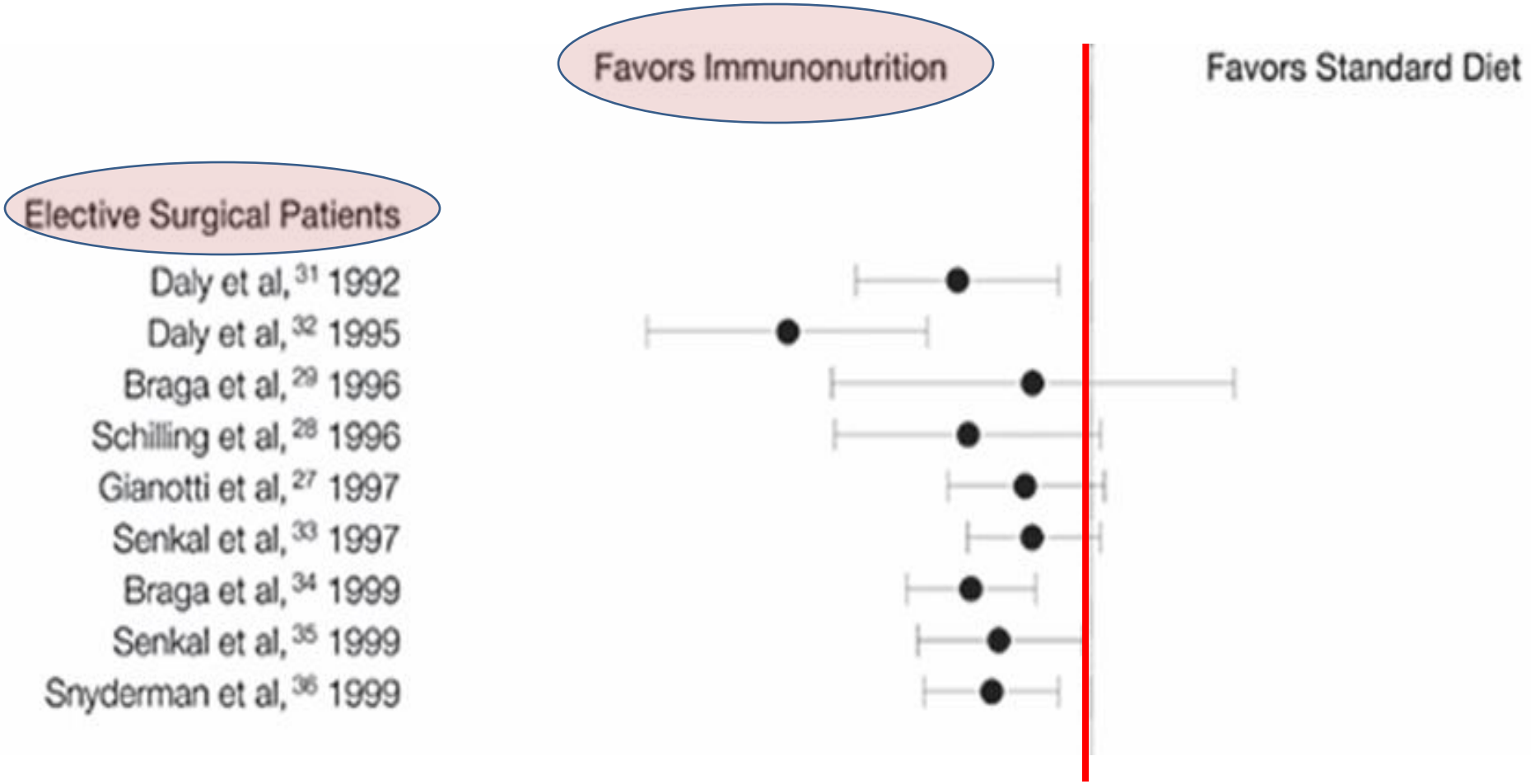
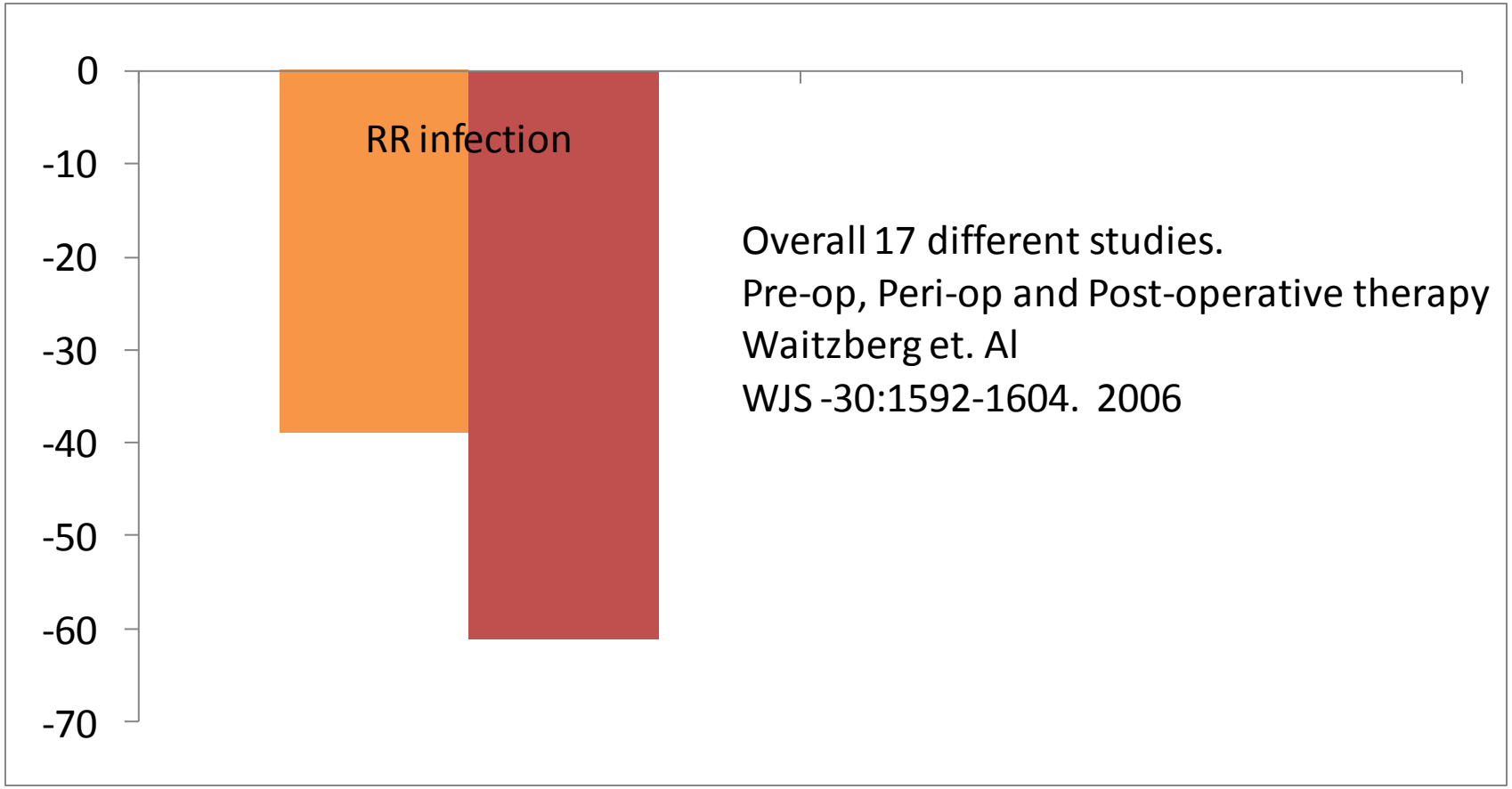


Figure 2

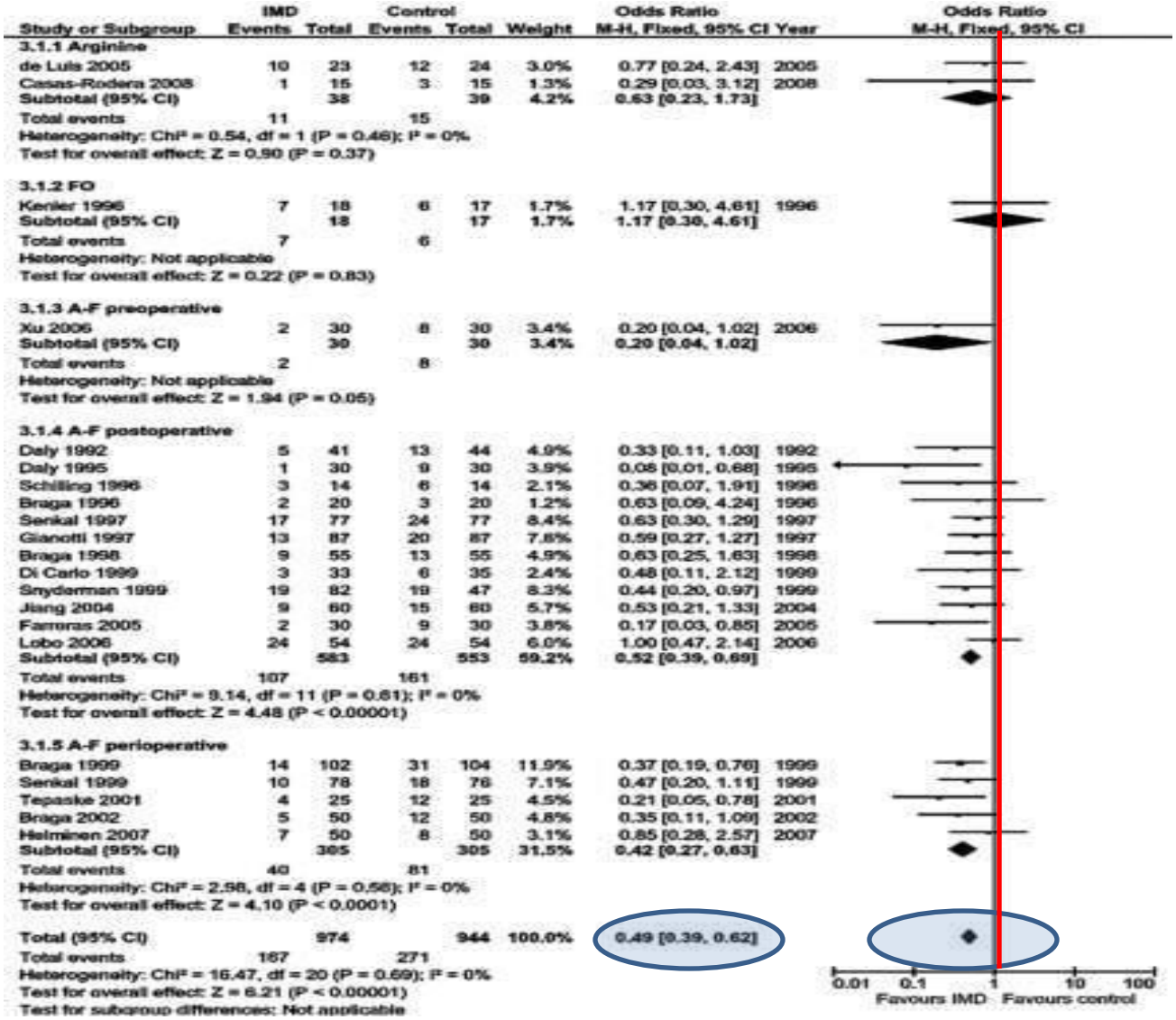
Effect of Arginine, Omega 3 Fatty Acids, Nucleotides on Surgical Infection

Waitzberg et. al. World Journal of Surgery



Effect of Immunonutrition on Infection

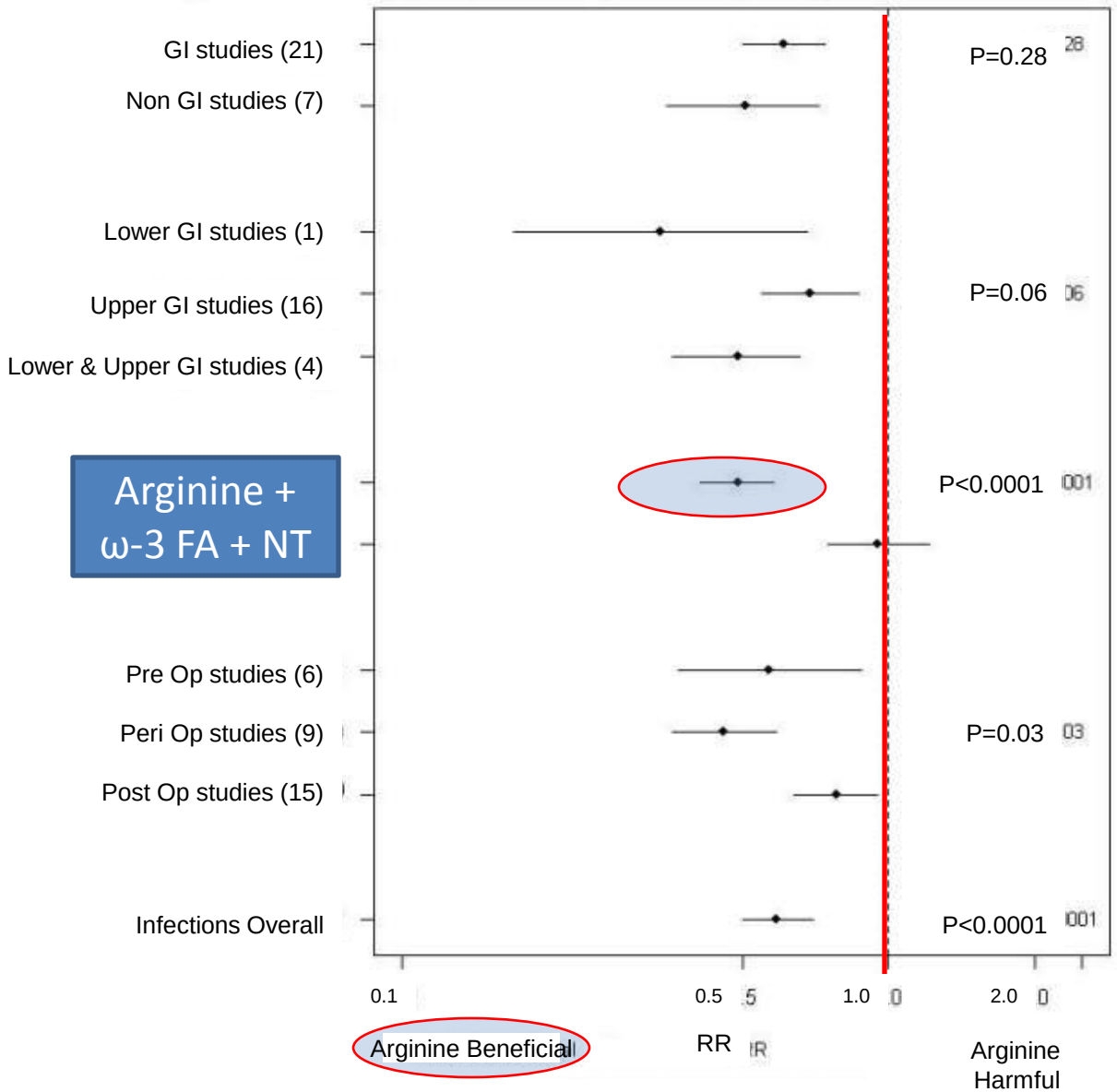
Marik P E , Zaloga G P JPEN J Parenter Enteral Nutr 2010;34:378-386



Effect of Dietary arginine on Postoperative Infections

Drover et. al. JACS 2011

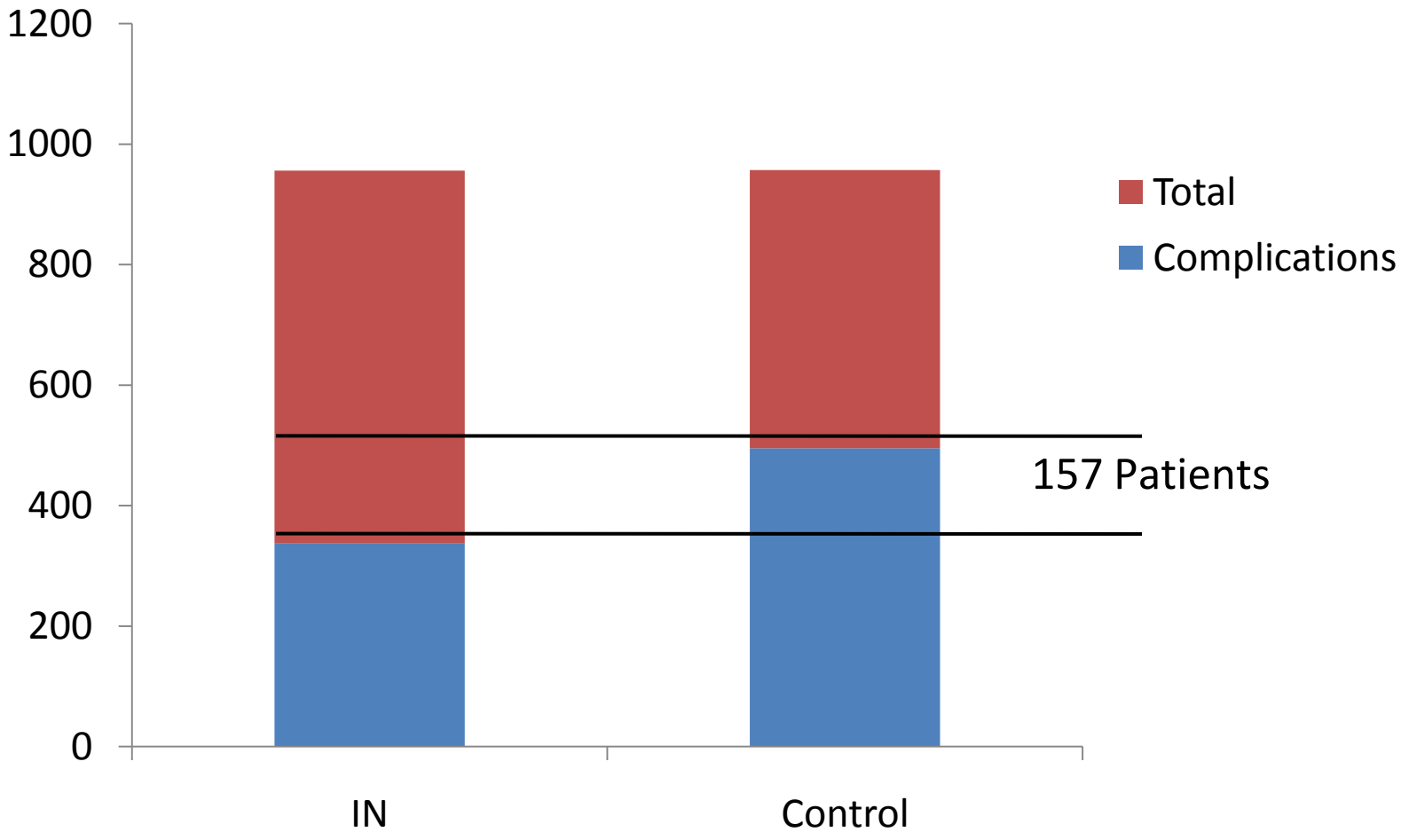
Figure 4. Results of Subgroup Analyses examining the Effect of Arginine Supplemented Diets on Infection



Number in parenthesis indicates number of studies

Immunonutrition in gastrointestinal surgery

Y. Cerantola, M. Hu¨ bner, F. Grass, N. Demartines and M. Scha¨fer



British Journal of Surgery 2011; ***98: 37–48***

Immunonutrition in gastrointestinal surgery Infections

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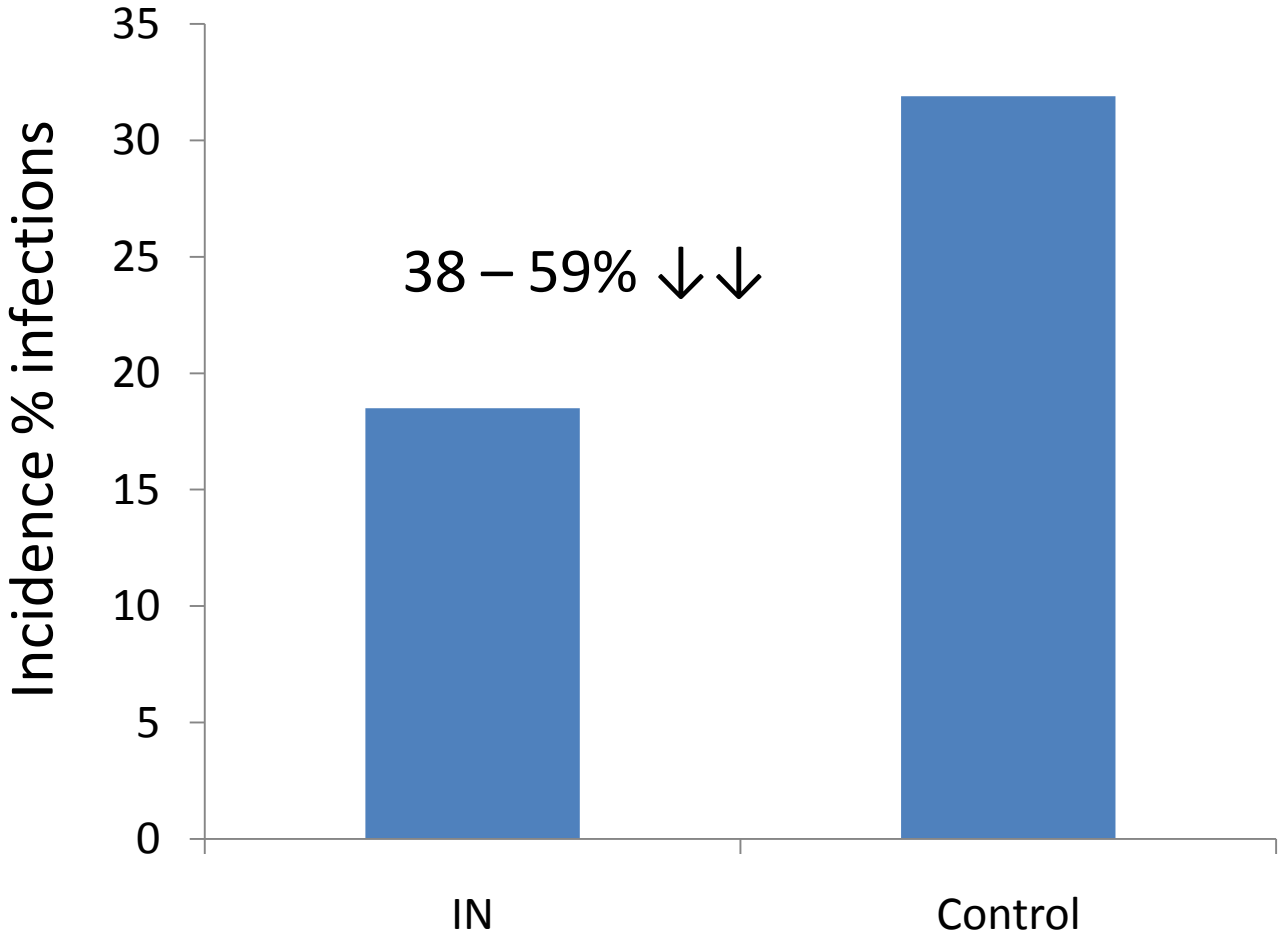
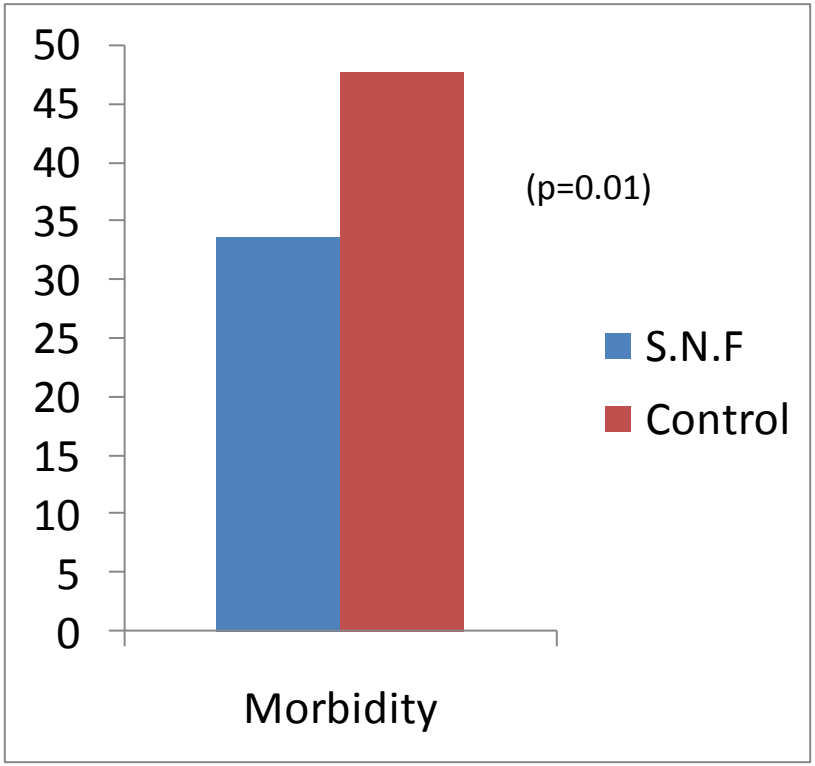


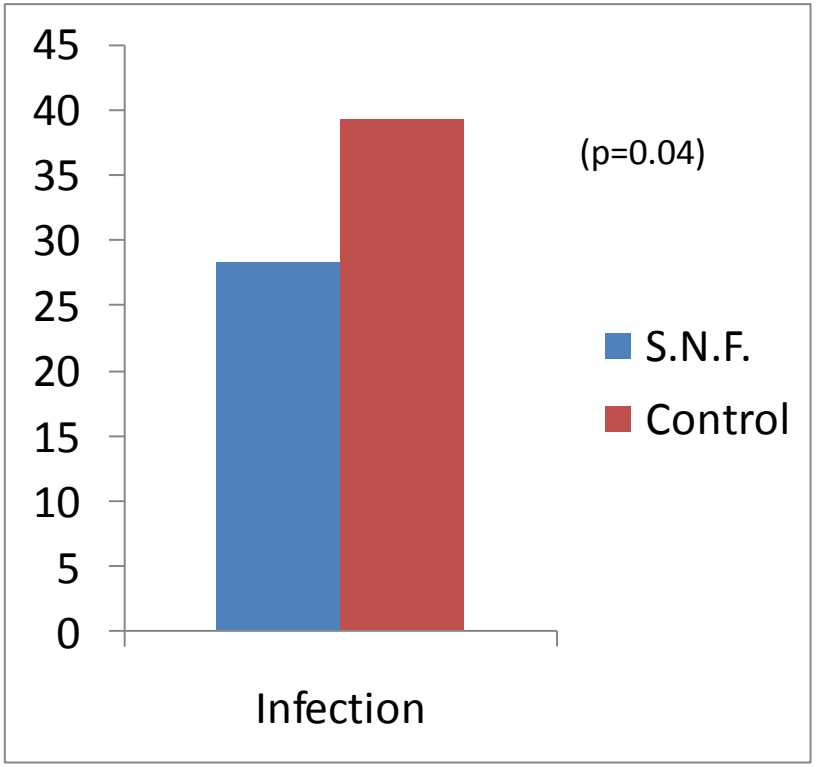
British Journal of Surgery 2011; ***98: 37–48***

Specialized Surgical Nutrition in Severely Malnourished Patients with Pancreatic Cancer

Complications



Infection



- Mortality also reduced
  - 1.3% vs 5.9% (p=0.035)

Klek et. al. Clin. Nut 5(S2):133. 2010

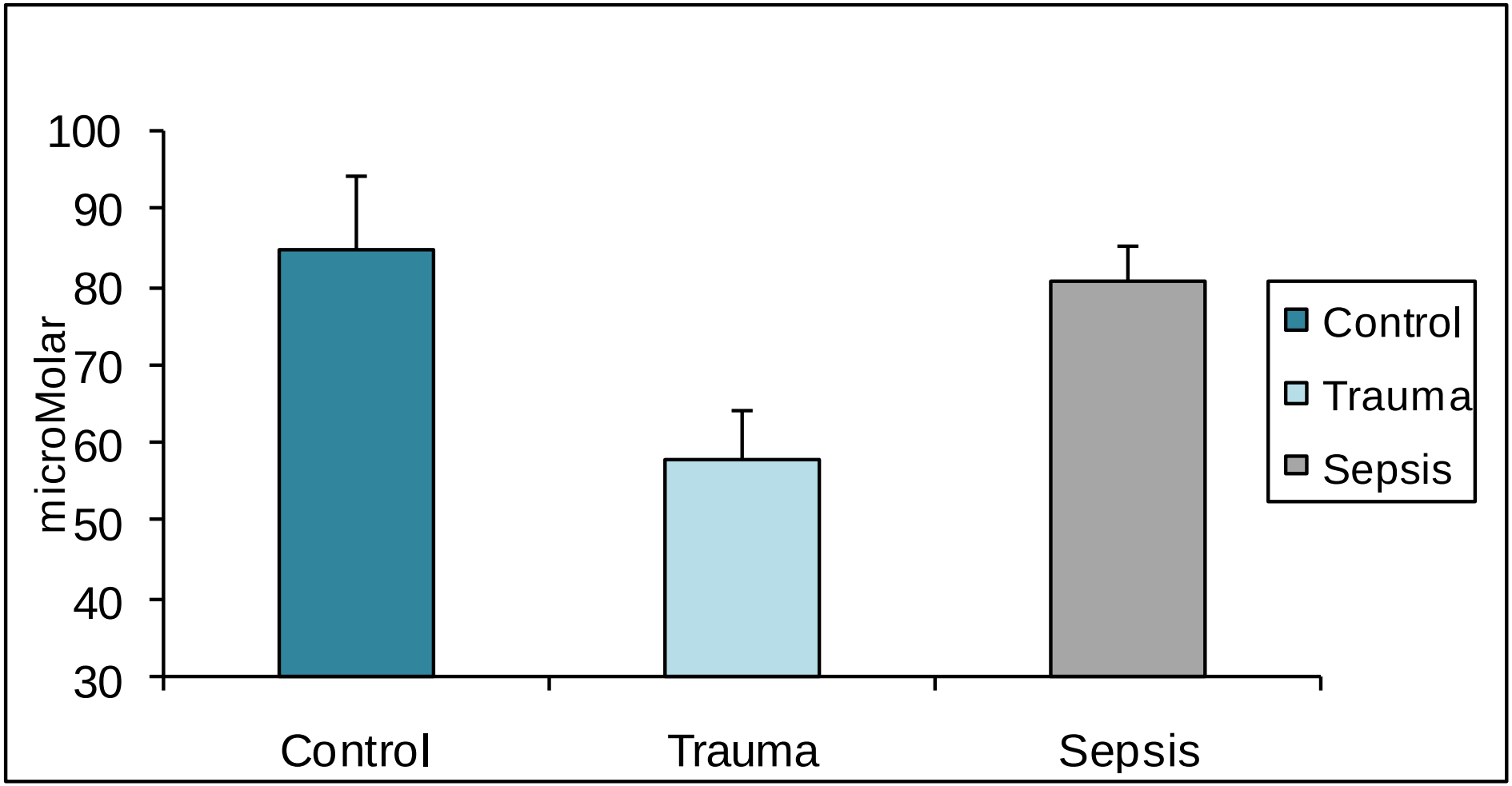
Initial Conclusions - Consensus

- Arginine, omega 3 fatty acids are uniformly beneficial - elective surgery patient
- Best data in GI surgery
- Length of Stay decreased by 2- 3 days
- Decreased infections
- Decreased complications
- Decreased severity of infections/complications
- No effect on mortality

Initial Conclusions (2) - Consensus

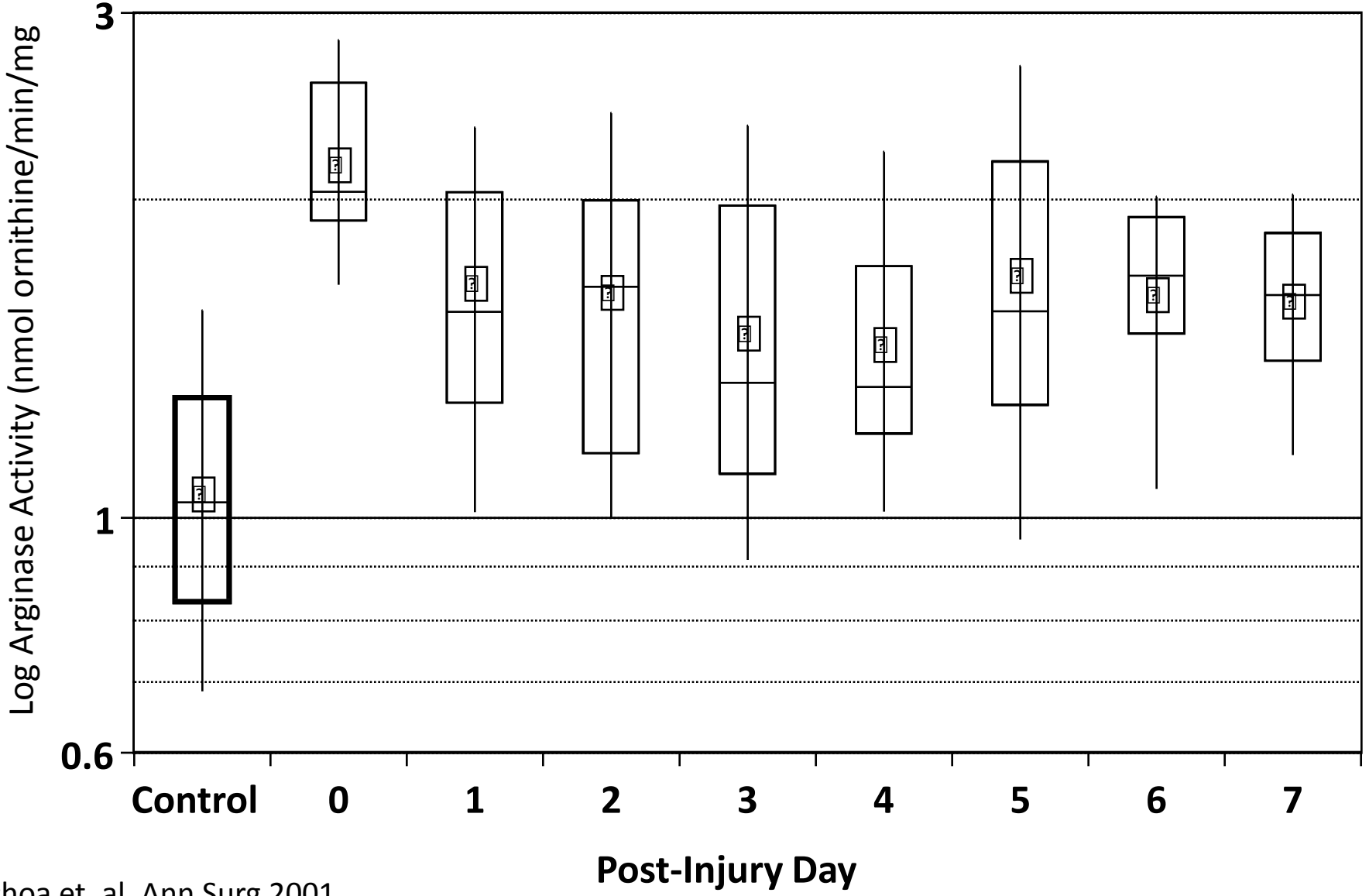
- All major clinical investigators and Nutrition experts agree.
- Societies and Professional organizations give it High grade of recommendations
  - ASPEN, SCCM, ESPEN
- Can it be adopted into clinical practice?
- How does Immunonutrition work?
- Is it cost-effective?

Arginine Plasma Levels



Ochoa Ann. Surg. Sept. 1991

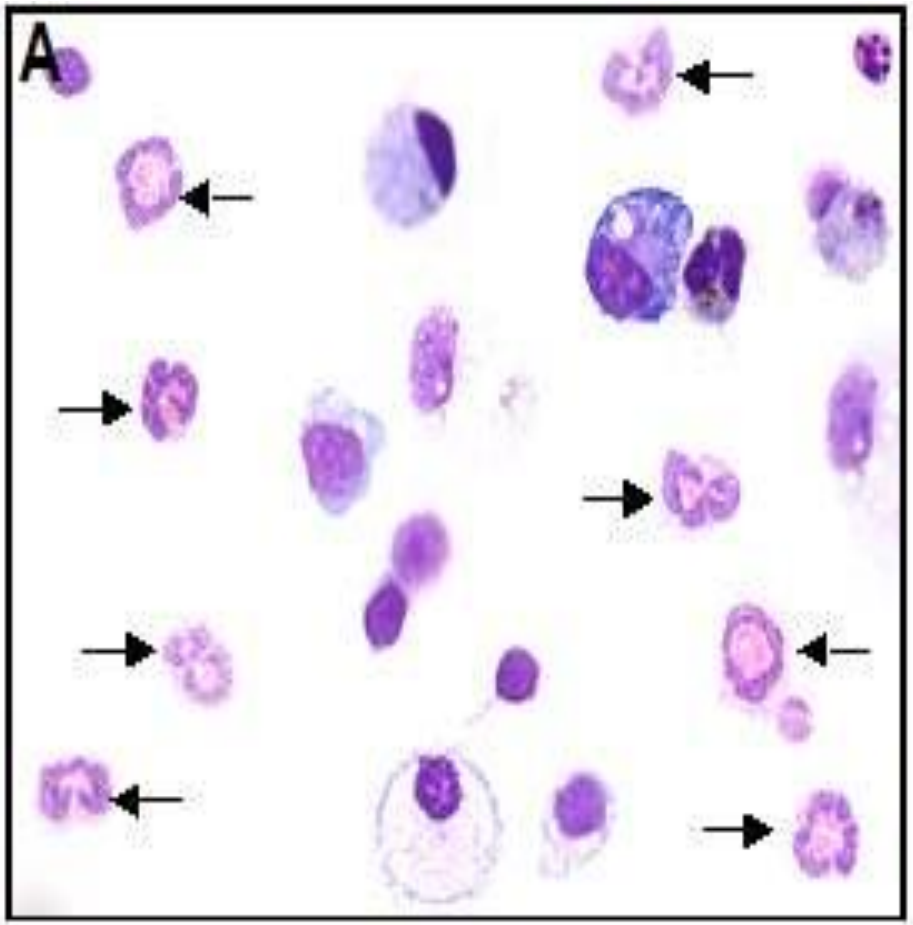
Arginase Activity After Severe Trauma



Ochoa et. al. Ann Surg 2001

Discovery of Myeloid Cells Expressing arginase

- Destroy Arginine
- Suppress Biological Functions (arginine-dependent)
  - Nitric Oxide
  - T lymphocyte Function
  - Wound Healing



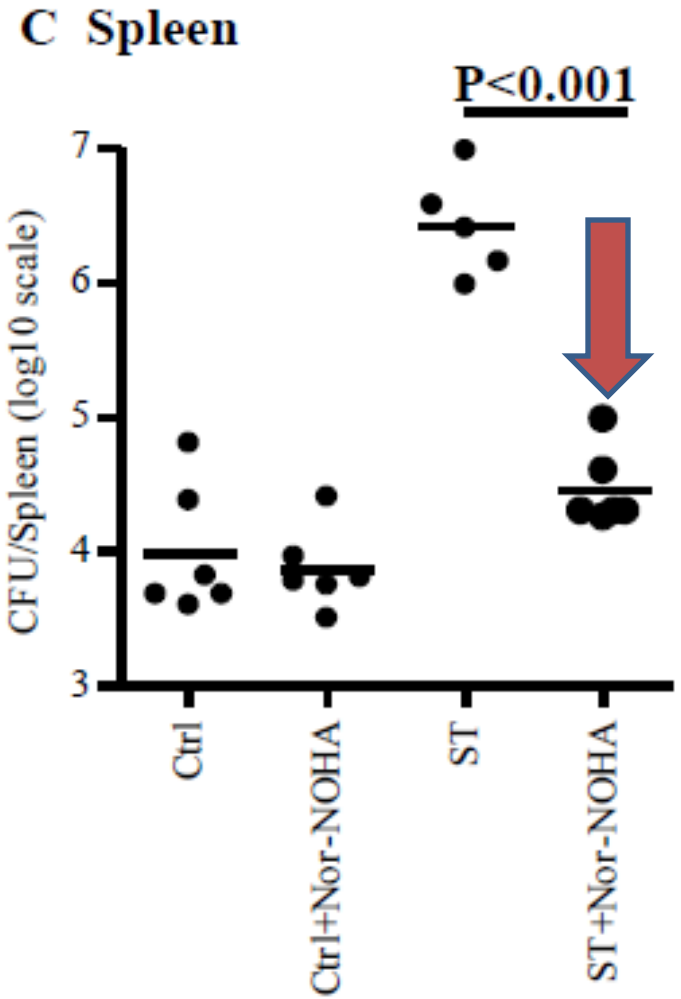
Myeloid Cells after Surgery/Trauma

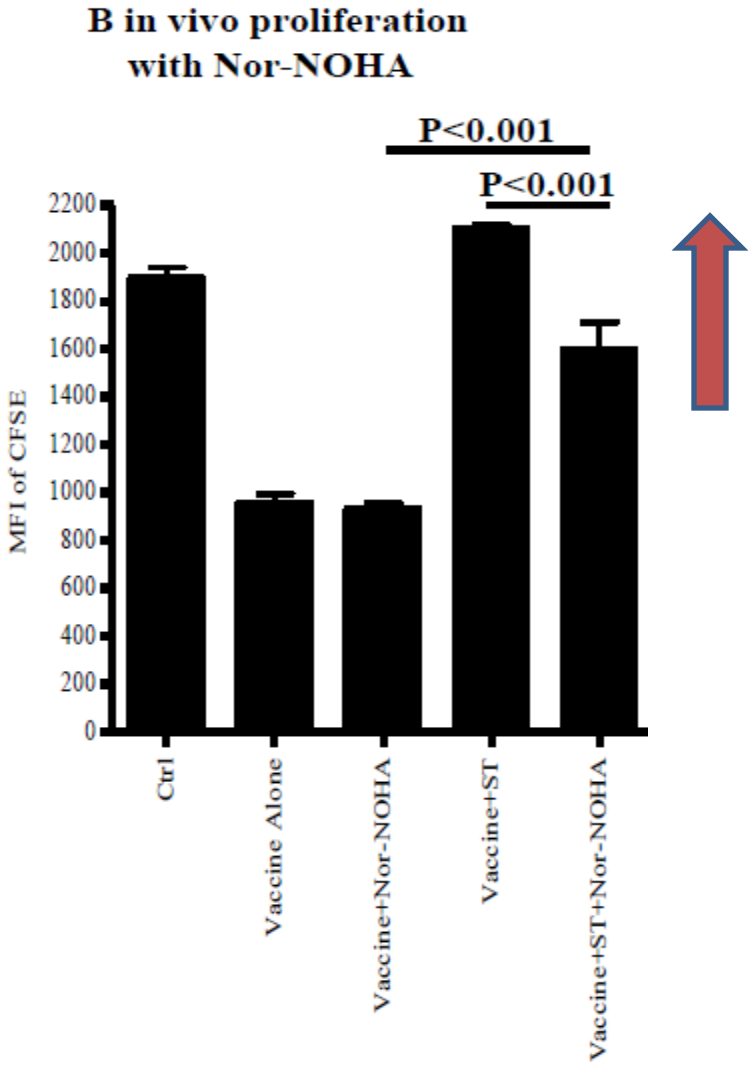
Arginine Deficiency Syndrome

Popovic, zeh, Ochoa 2006 J. Nutr. 137;6(2). 1681-

- Clinically recognizable features (signs, symptoms, biomarkers)
- Arginine deficiency
  - Low arginine
  - T cell markers
  - Decrease Nitric Oxide production
- Mechanism of production of arginine deficiency
  - Arginase in Myeloid cells
- Biological consequences of worsening of disease
  - Increased infection
  - Observed in cancer, leprosy, tuberculosis, other
- A successful treatment

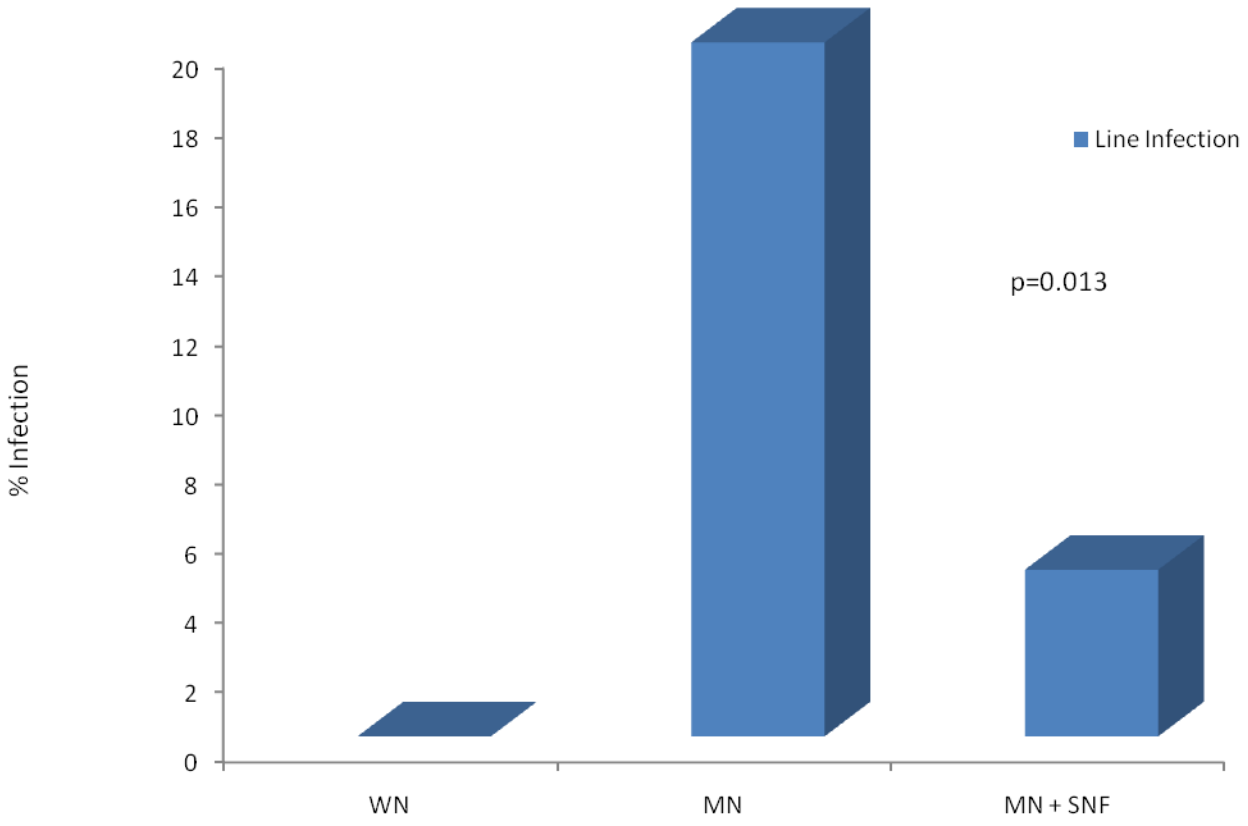
Blocking Arginase improves Rodent's capacity to reduce infection and improve T cell function





Zhu, Ochoa Submitted Journal of Immunology

Effect of a SNF on line infections in severely malnourished patients undergoing surgery for Colo-rectal Cancer



Preoperative oral arginine and n-3 fatty acid supplementation improves the immunometabolic host response and outcome after colorectal resection for cancer

Marco Braga, MD, Luca Gianotti, MD, ScD, Andrea Vignali, MD, *and* Valerio Di Carlo, MD, *Milan, Italy*

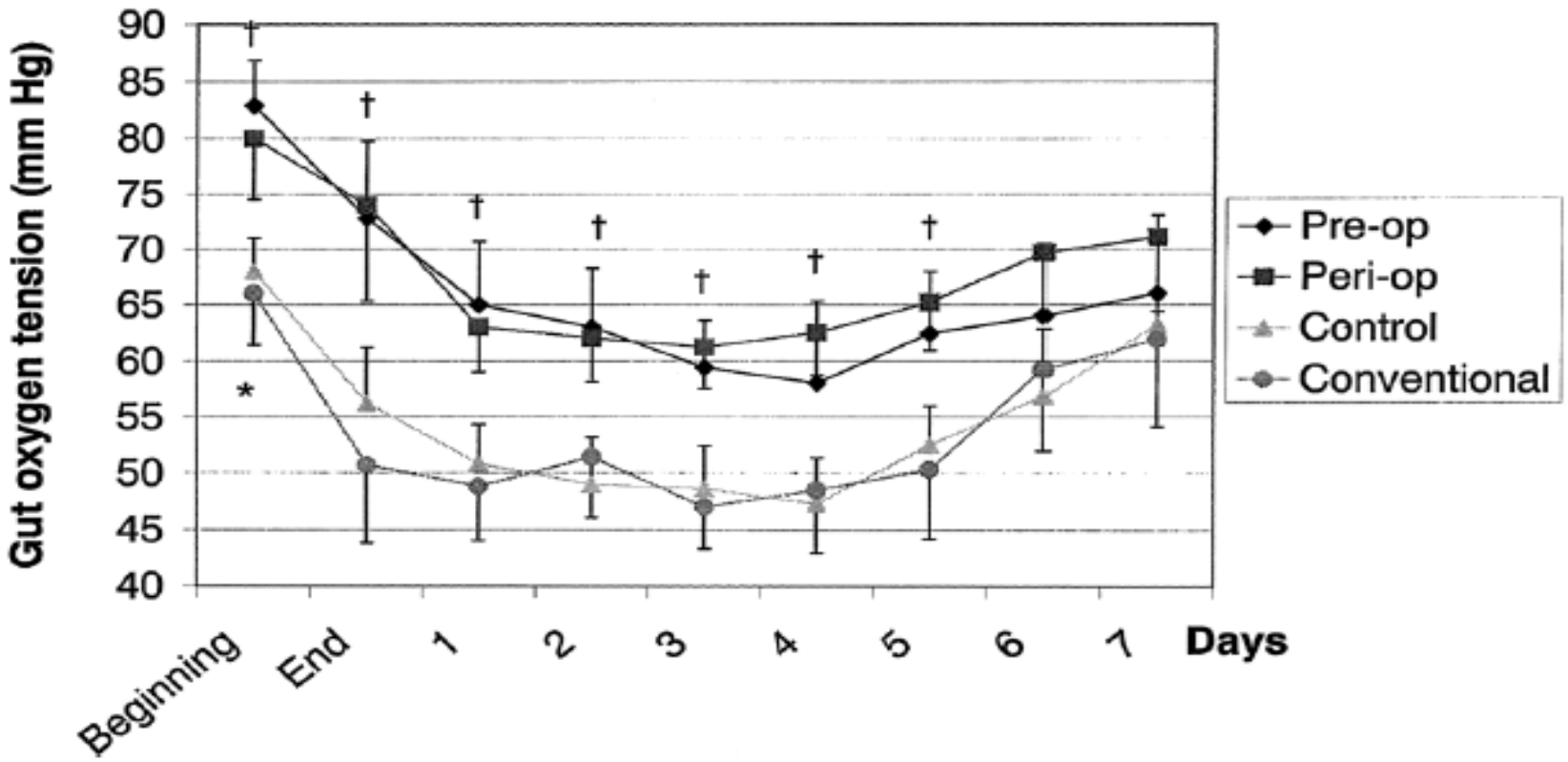
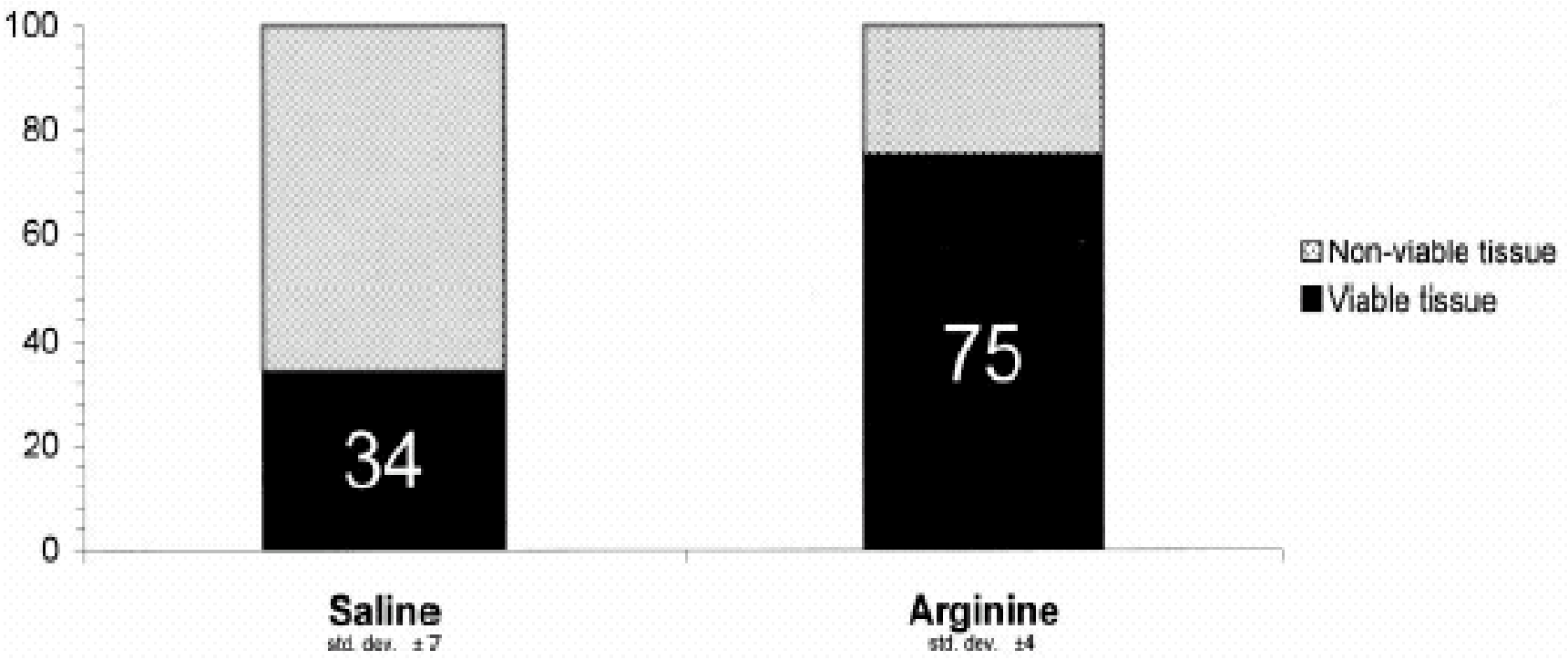


Fig 6. Gut oxygen tension, as measured by polarographic implanted microprobes during surgery and throughout the first postoperative week. *$P < .007$ beginning vs end for control and conventional. †$P < .01$ pre-op and peri-op vs control and conventional.

Surgery
Volume 132, Number 5

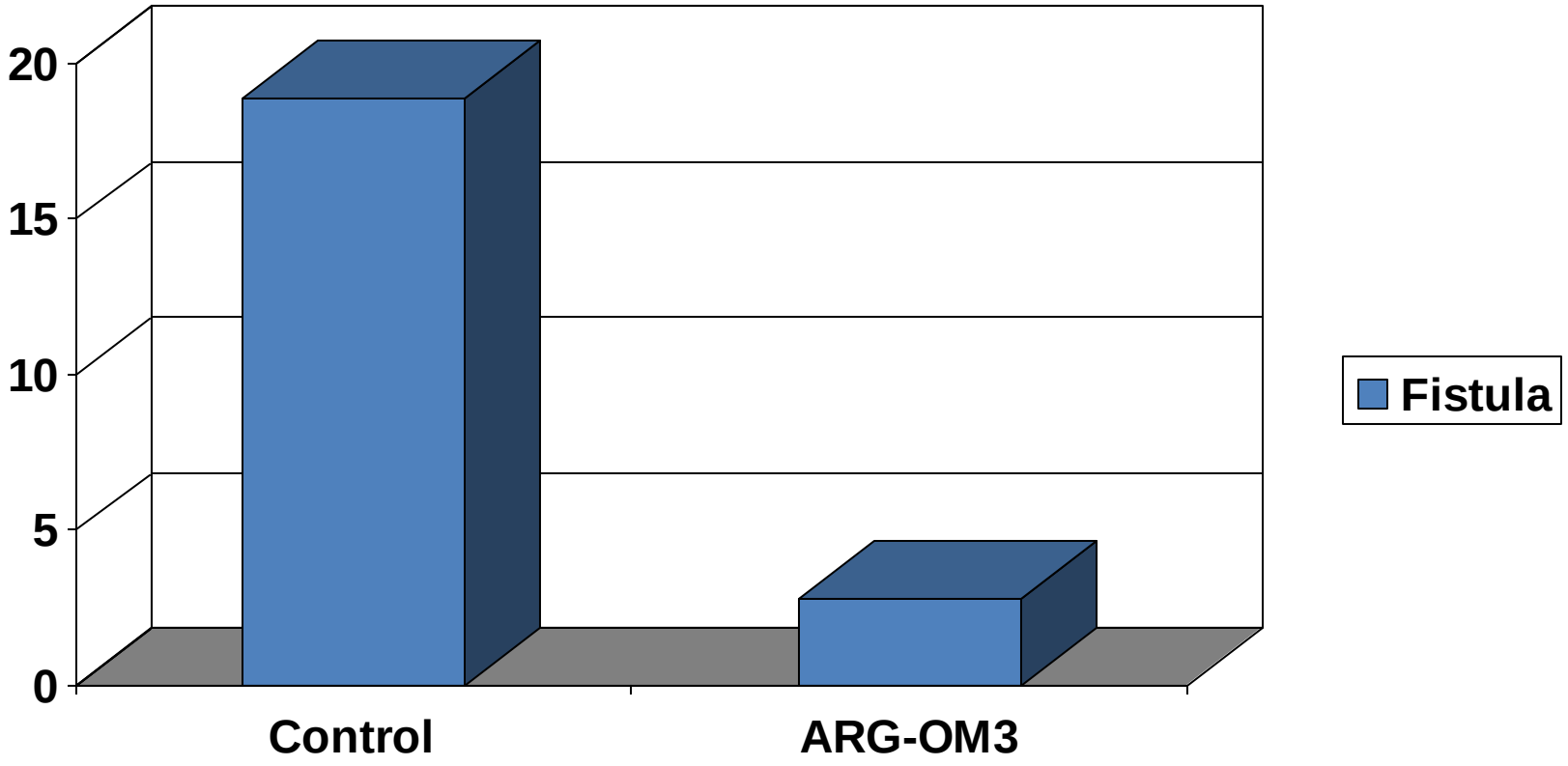
(Surgery 2002;132:805-14.)

Effect of Arginine on % Pedicle Flap Survival



Lovett et. Al Ann. Plast Surgery 2001

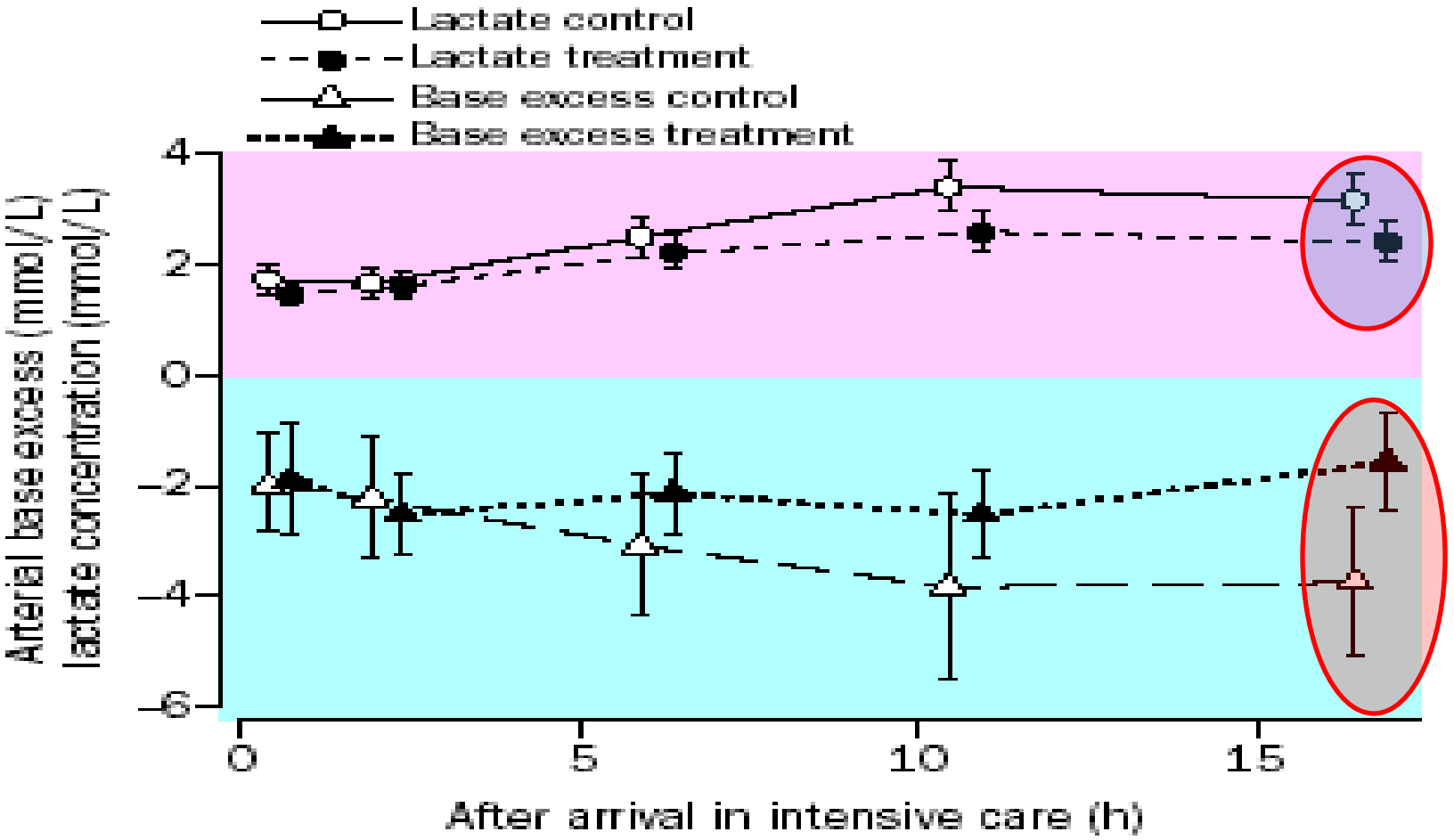
Effect of Arginine and Omega 3 FA on Flap Survival in Surgery for H&N cancer



De Luis et. Al. Eur. J. Clin. Nutr. 61(2):200-. 2007

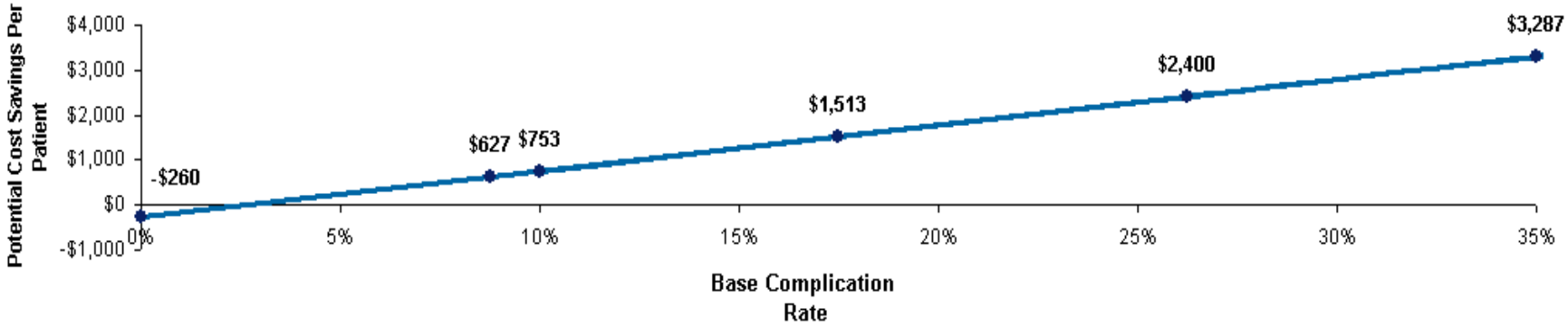
Effect of ARGOM3 on Microcirculation after Open Heart Surgery

Tepaske - Lancet 2001



Circulating NOx were Increased

Projected Savings from Reduction in Infectious Complications in GI Cancer surg- Perioperative Use of Immunonutrition – Unpublished RTI™ – North Carolina

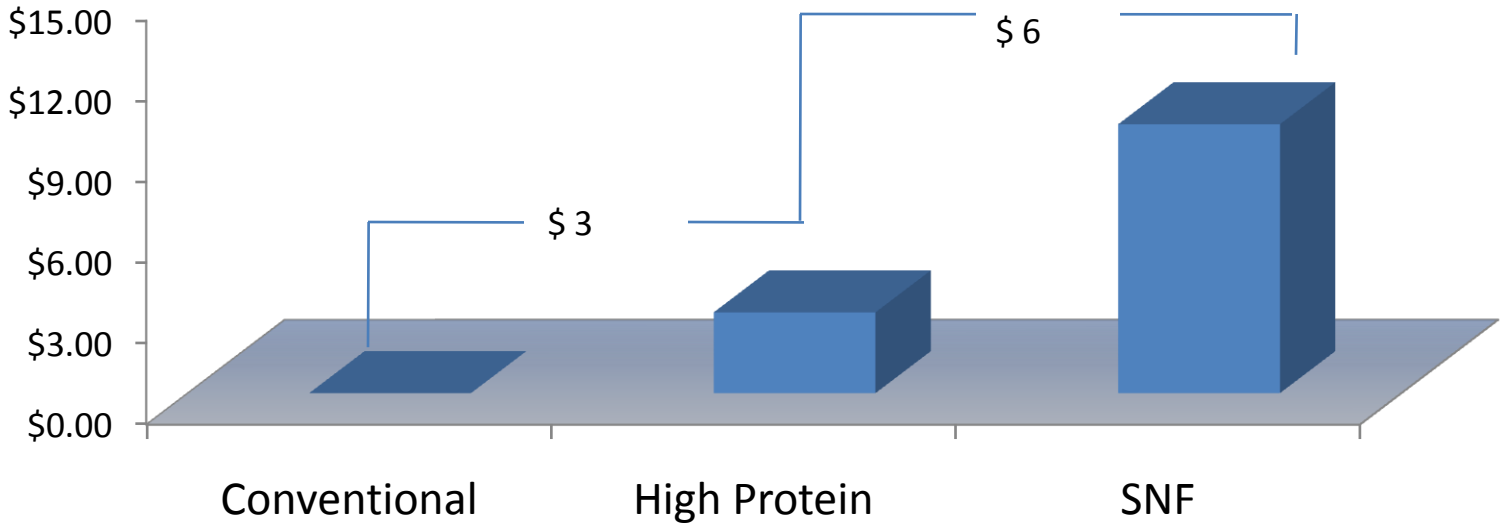


Sensitivity Analysis** Assumes:

- Meta-analysis outcomes of Waitzberg et al 2006
- Weighted average of additional costs attributed to different types of complications estimated from HCUP
- Oral IMF TID x 5 days pre-op; 1 L TF IMF/d x 7 days post-op
- At baseline infectious complication rate of 15%, projected savings = $1,260 per patient. 100 patients= $126,000

*Arg-n3-nucleotide formula**Example purposes. Not intended to guarantee specific reductions in cost or complications.

Approximate Cost/day of Nutrition Intervention



Unpublished Nestle

High Protein Drink	SNF
Per Unit: $1	Per Unit: $3.33
Per Day (3 boxes): $3	Per Day (3 boxes): $9.99
Regimen (3 boxes * 5 days): $15	Regimen (3 boxes * 5 days): $50
Difference for 5 days: $35	

Implementing Nutrition Intervention

Inadequate assumptions

- Moderate starvation is well tolerated
- That oral nutrition needs to be controlled to avoid complications
  - NPO for procedures
- Lack of consequences if the patient is kept NPO
- Lack of Policies and Protocols
- Inadequate education of health care workers
- You can “make up for it” later
- *Laissez faire* attitude

Keeping the Patient NPO during illness

The Gas we Pass – Shinta Cho

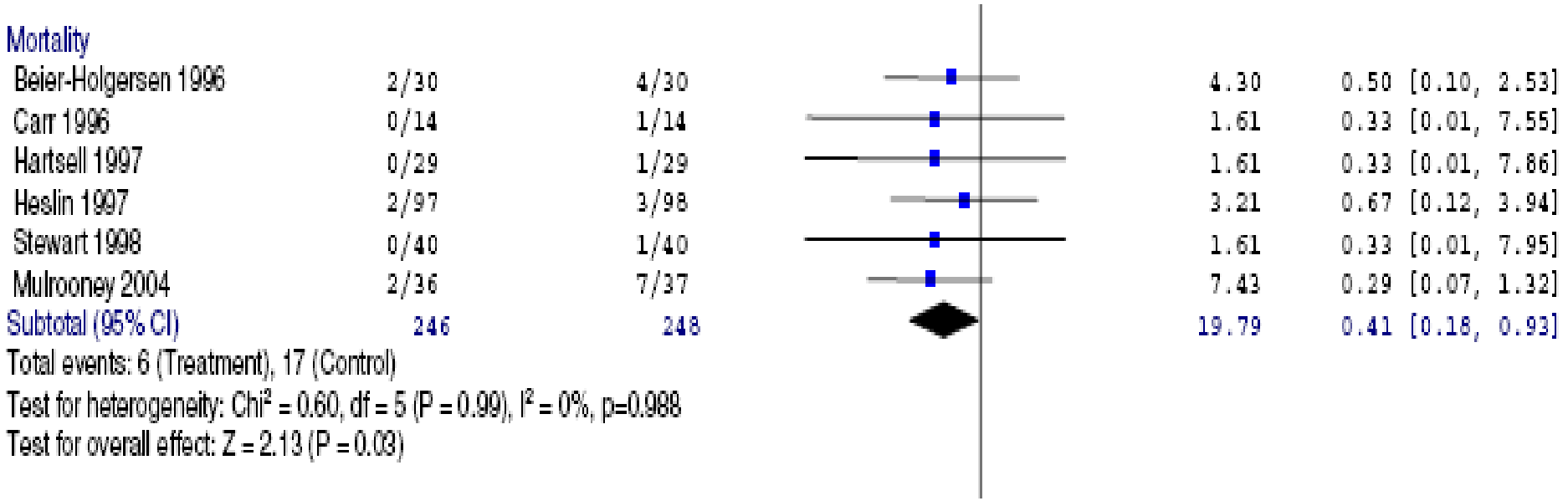
When you begin to fart after an operation

It means your intestines have started working again

Early Enteral Nutrition - Mortality

Stephen J. Lewis & Henning K. Andersen & Steve Thomas

Thirteen Trials 1173 patients Gastrointestinal Surgery



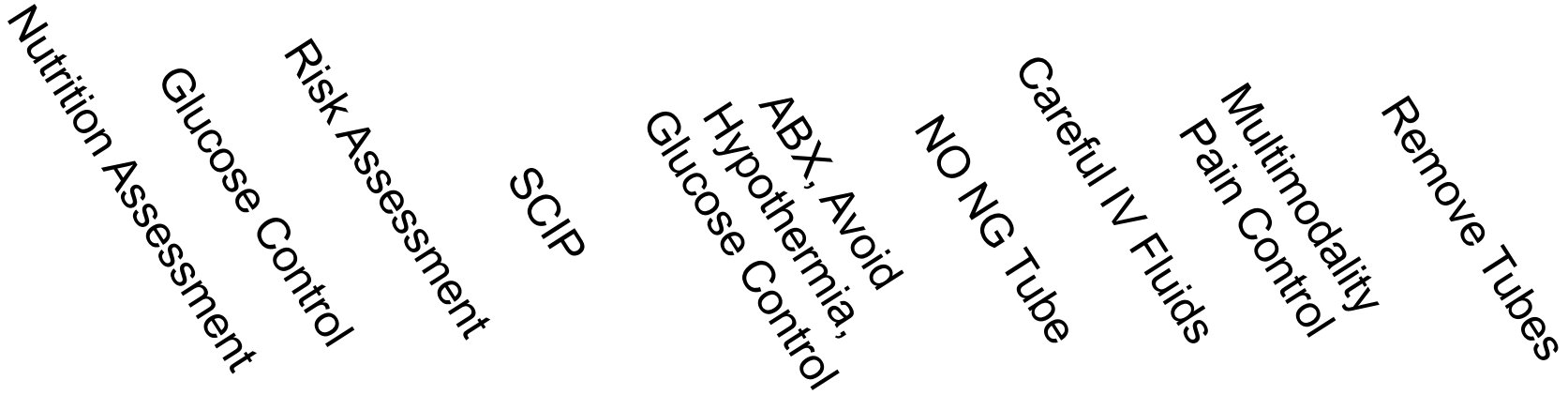
Early enteral nutrition within 24 h of intestinal surgery versus later commencement of feeding: a systematic review and meta-analysis. J Gastrointest Surg 2009; 13:569-575.

Optimized Nutrition Intervention

Performance Improvement

- Assess the current state of Nutrition
  - Analyze the prevalence of malnutrition on admission
- Create plans for Intervention
  - Change the Name from Nutrition support service to Medical Nutrition Intervention team
  - Give the MNI the importance that it deserves
- Establish education programs
- Establish protocols
- Establish Carrots and sticks
- MONITOR, MONITOR, MONITOR

Enhancing surgical Outcomes through Process Improvement



Pre-operative Phase

Surgery

Post-operative Phase

Can Eat

Oral Nutrition Supplement Arginine, ω- 3FA

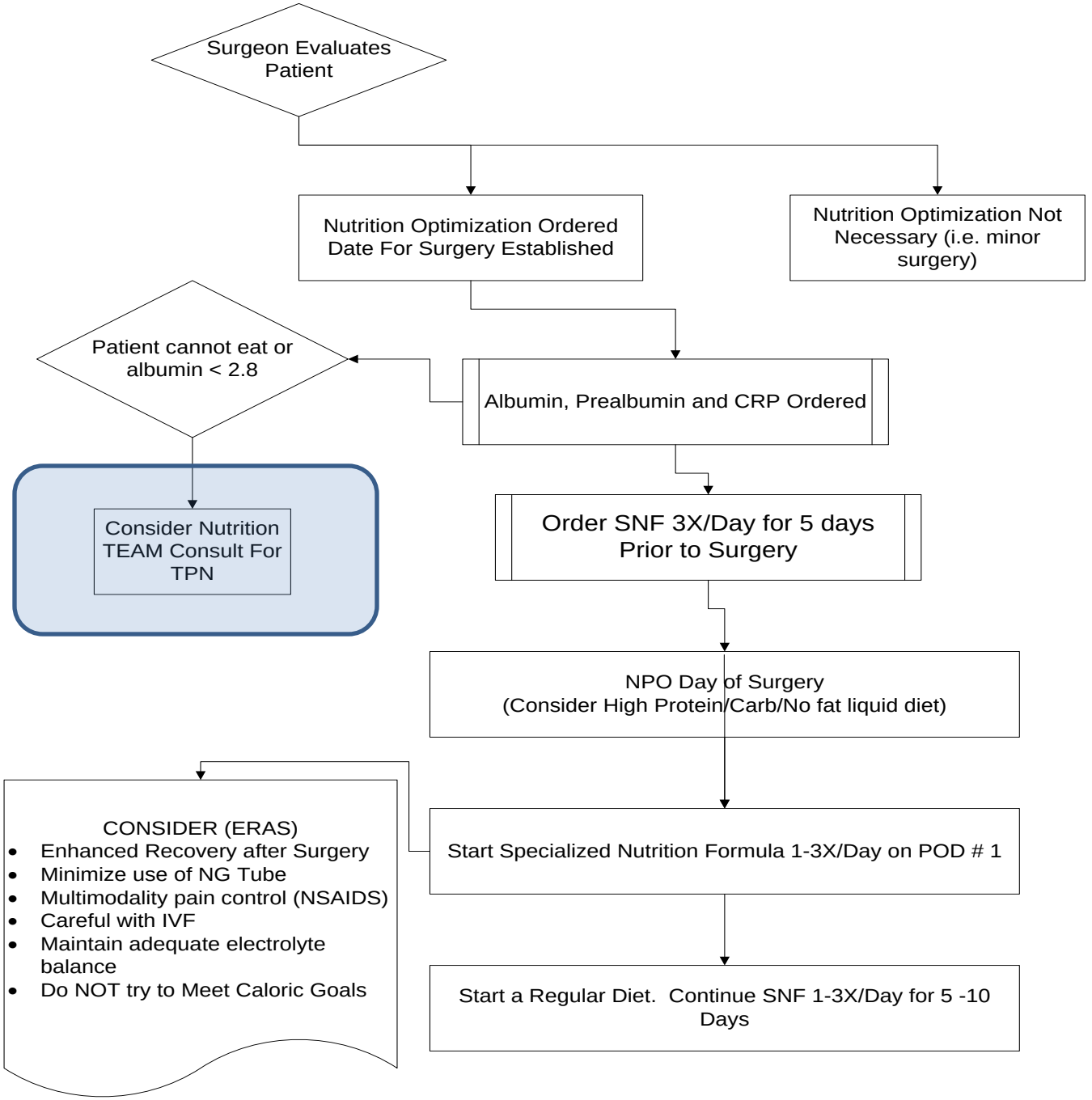
3 /Day for 5 Days

Early Oral /Enteral Intake

Oral/Enteral Nutrition Supplement Arginine, ω- 3FA

2-3 /Day for 5 - 10 Days

Nutrition Protocol



Peri-operative Care

- Pre-op. Oral supplementation of
  - arginine, ω-3 FA, vitamin A
    - 5 days 3 X a day
- SCIP Interventions
- Post-op Early oral Nutrition
  - High Carbohydrate oral drink 6-18 hours
  - arginine, ω-3 FA, vitamin A
    - 5 days 3 X a day
- Adjunct therapy – Enhanced recovery after surgery (ERAS)
  - NO NG
  - NSAIDS
  - Careful use of IVF
- Home in 3-4 days.

Thank you !

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