Why Are Trauma Patients So Hungry?

Kelsey Higgins, MS, RD, LD, CNSC, Jordan Rahm, BA, Darrell L. Hunt, MD, PhD, FACS

TriStar Skyline Medical Center, Nashville, TN

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Disclosure

- Presenters
  - Kelsey Higgins, MS, RD, LD, CNSC
  - Darrell L. Hunt, MD, PhD, FACS

- The authors have nothing to disclose

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Objectives

1. Discuss the physiology associated with major trauma
2. Discuss the methods and timing of nutrition delivery for critical trauma patients
3. Learn how to create a standardized protocol to provide early enteral nutrition to critically injured patients

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The Physiologic Response to Trauma

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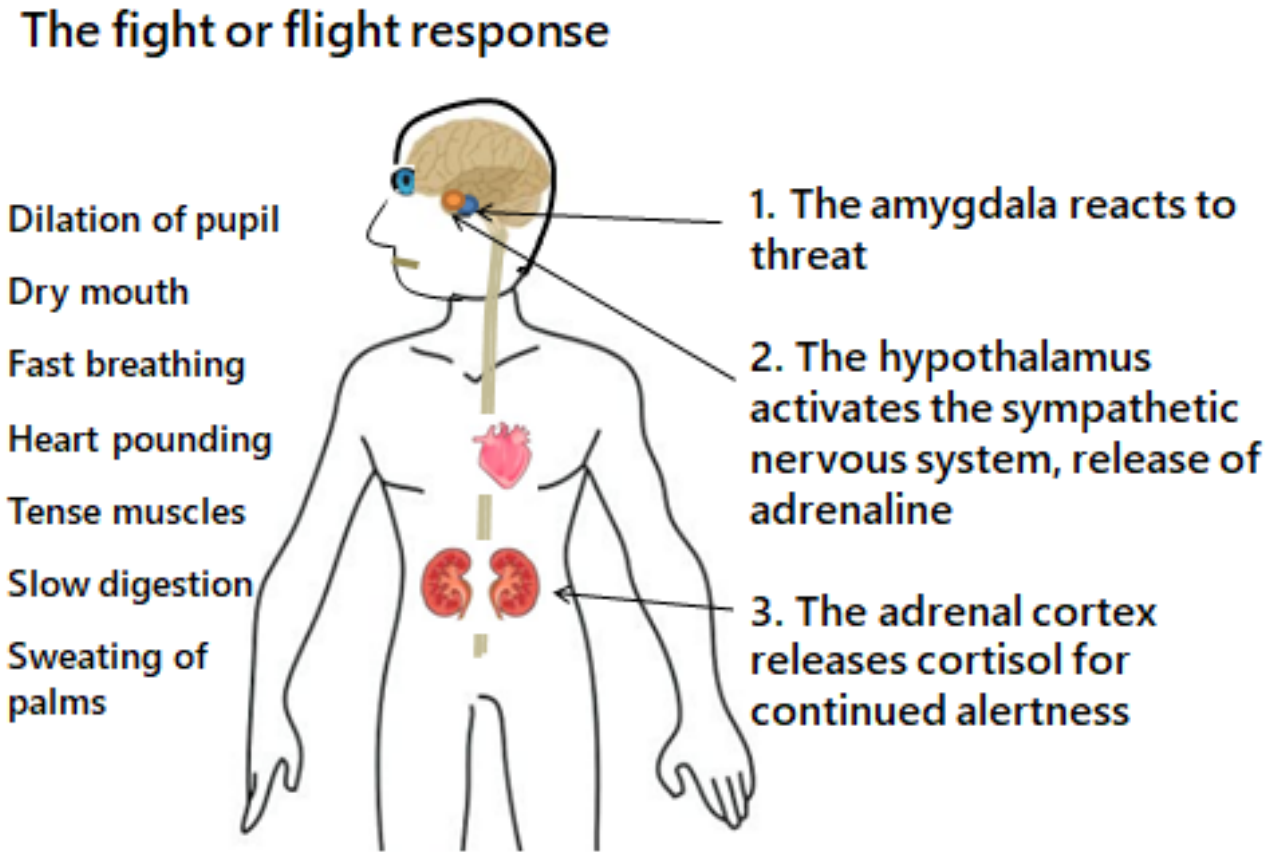

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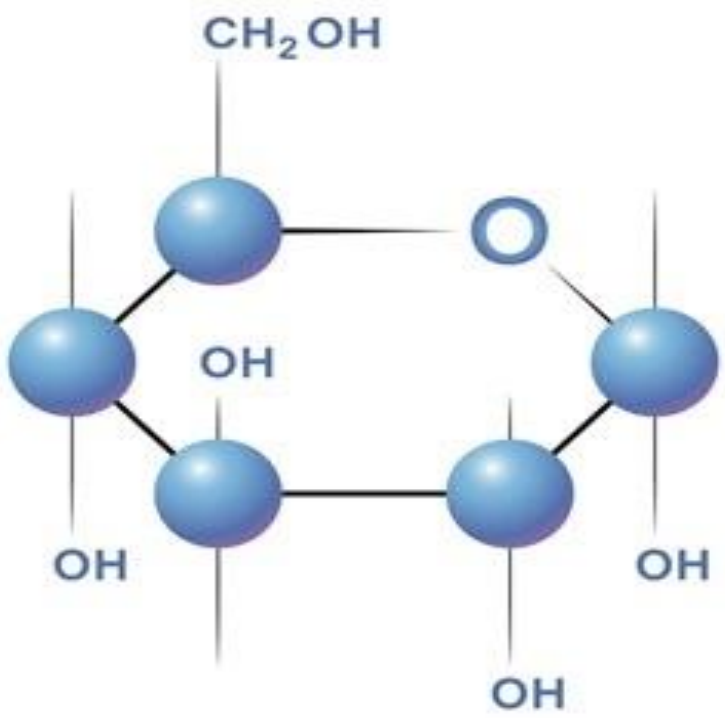

Glucose

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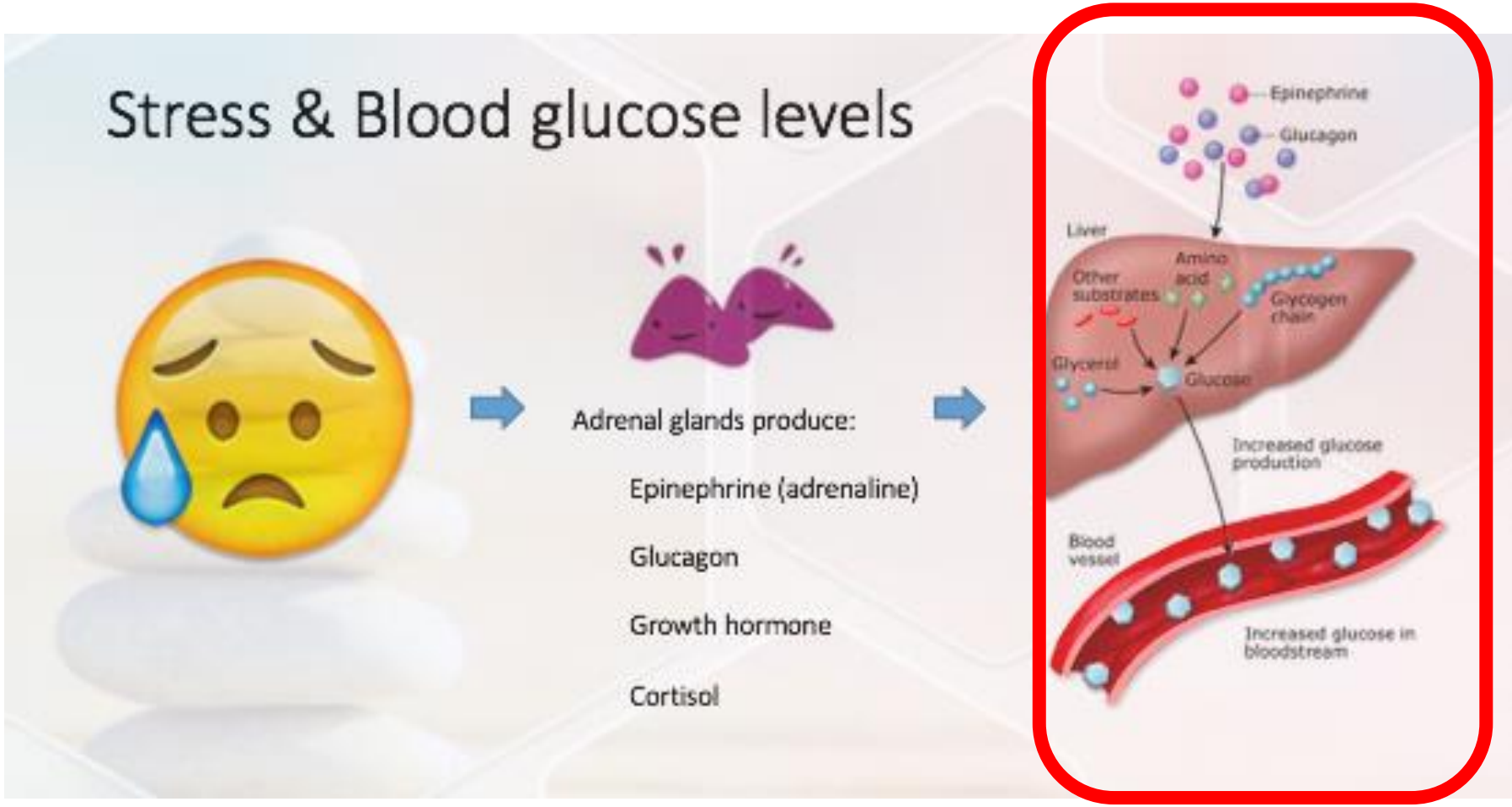

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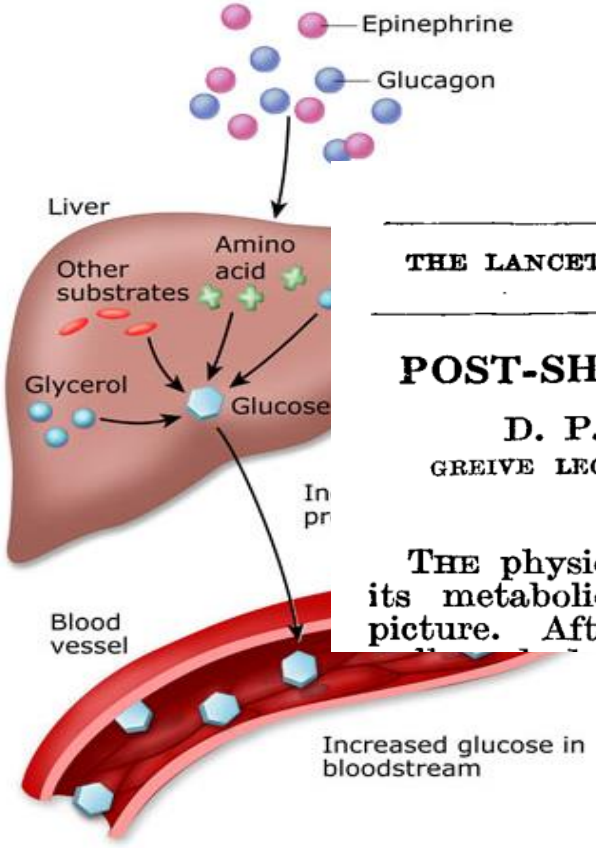

THE LANCET] ORIGINAL ARTICLES [APRIL 11, 1942

POST-SHOCK METABOLIC RESPONSE *

D. P. CUTHBERTSON, M.D., D.SC. GLASG.
GREIVE LECTURER IN PHYSIOLOGICAL CHEMISTRY IN THE UNIVERSITY OF GLASGOW

THE physiological response to trauma, in particular its metabolic component, exhibits a very complex picture. After an injury there is an immediate and

the basal metabolism of cats was roughly proportional to the severity of the shock produced, and that recovery after transfusion was usually associated with a prompt return of the metabolic rate to normal. It was found that this change in metabolic rate might precede the well-marked fall in blood-pressure. This is of particular interest in view of Grant and Reeve's recent observations on the blood-pressure of air-raid casualties.

It is interesting to note too that Carrel (1930), when discussing the causal relations between the loss of a

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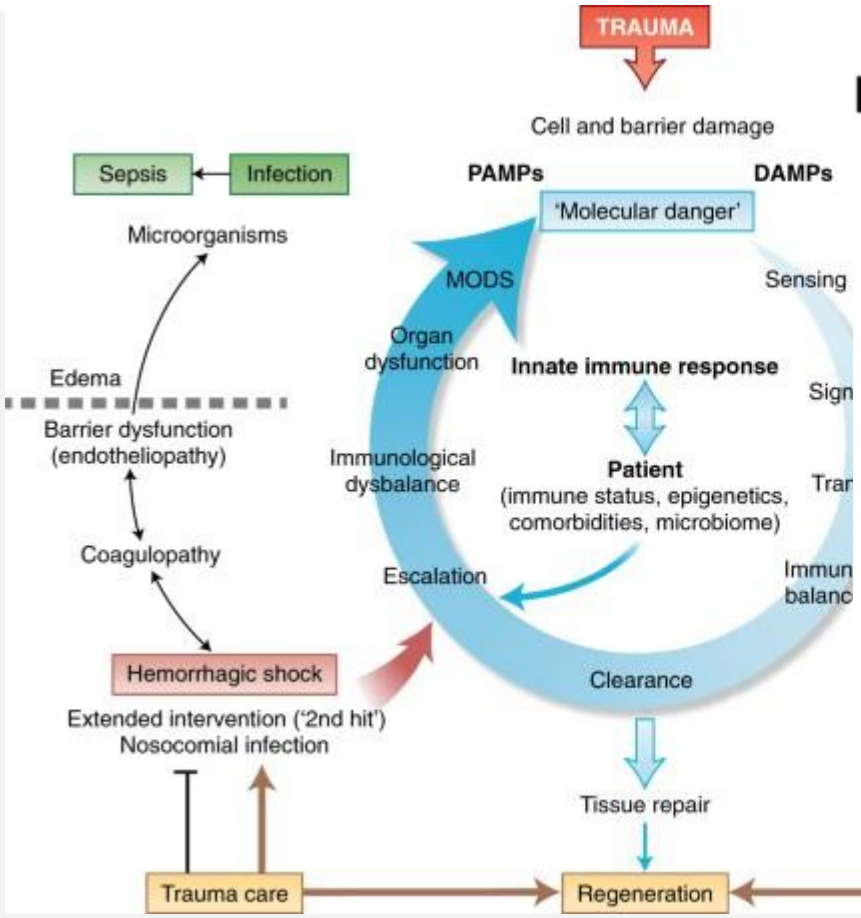

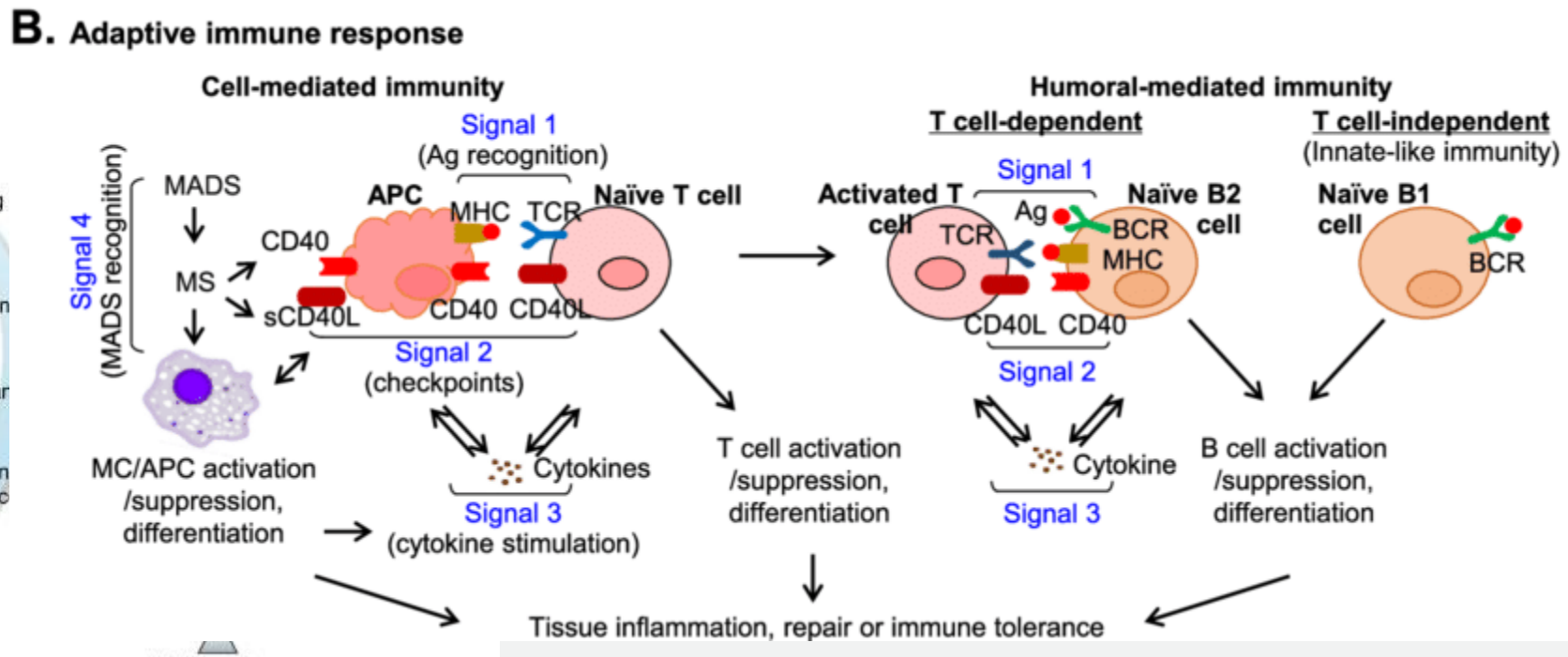

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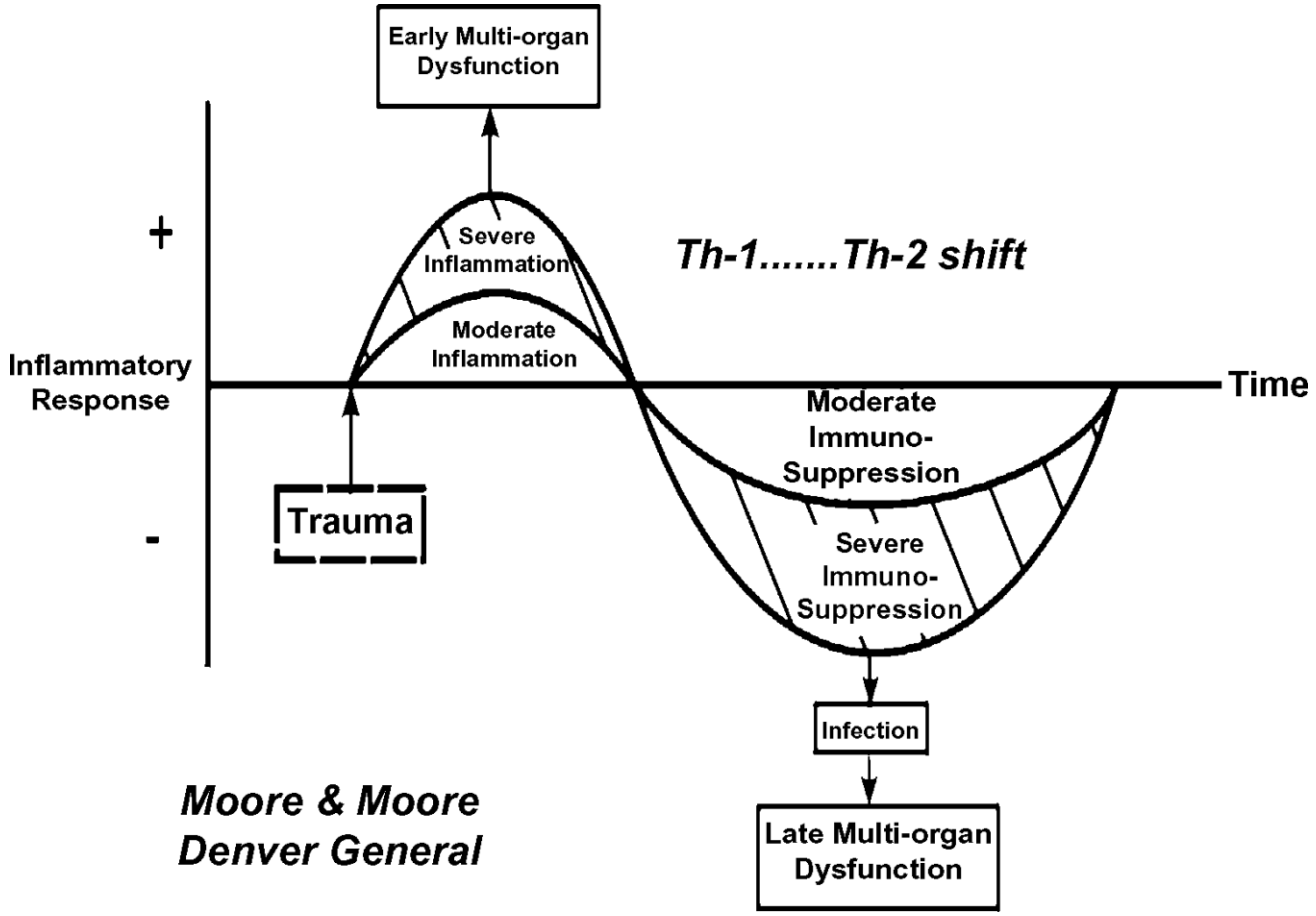

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The Physiologic Response to Trauma

0148-6071/79/0306-0452$02.00/0
JOURNAL OF PARENTERAL AND ENTERAL NUTRITION

Metabolic Response to Injury and Illness: Esti
Protein Needs from Indirect Calorimetry an

CALVIN L. LONG, PH.D., NEAL SCHAFFEL, B.S., JOHN W. GEIGER, B.A.,

TABLE II

Increases in energy expenditure followi

Per cent increase in RME is above normal.

Elective surgery	Skeletal trauma	Blunt trauma	Trauma with steroids
23.9 ± 3.9[a]	32.2 ± 2.7	36.6 ± 13.0	60.8 ± 6.7

[a] Mean ± SEM

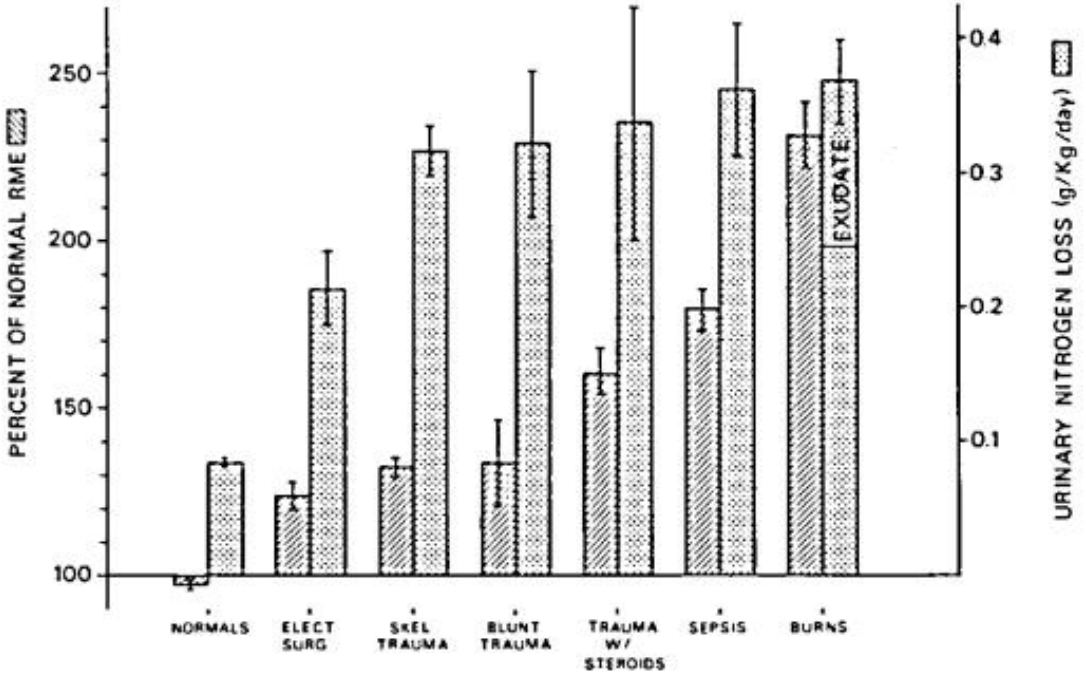

FIG. 1. Percent increase above normal and urinary N losses in g/kg/day in the various groups.

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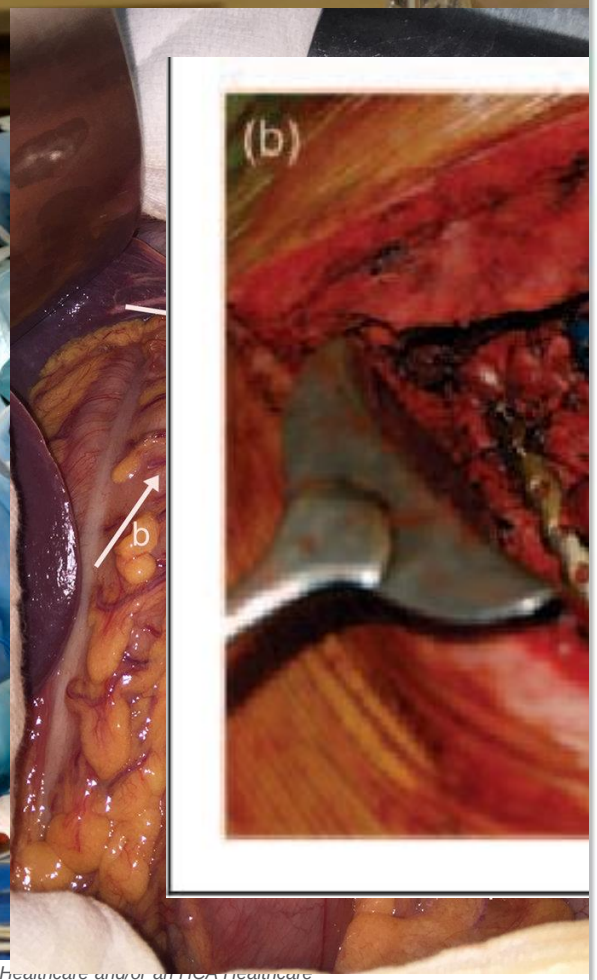

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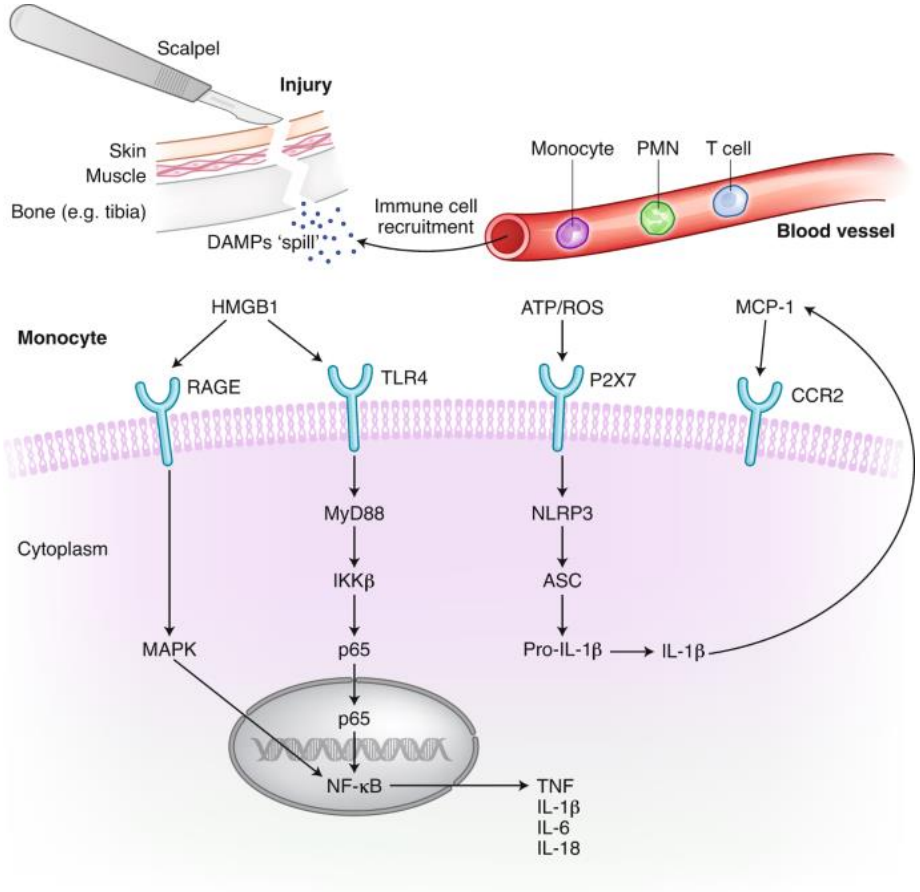

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Why Are Trauma Patients So Hungry?

- Surviving trauma requires a massive amount of energy
  - Rapid response to danger (glucose surge)
  - Activation of the innate and adaptive immune systems
  - Healing

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Enteral Nutrition Is Possible After Major Abdominal Trauma

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Immediate Jejunostomy Feeding

Its Use After Major Abdominal Trauma

Ernest E. Moore, MD; Ernest L. Dunn, MD; Todd N. Jones, RN

Arch Surg—Vol 116, May 1981

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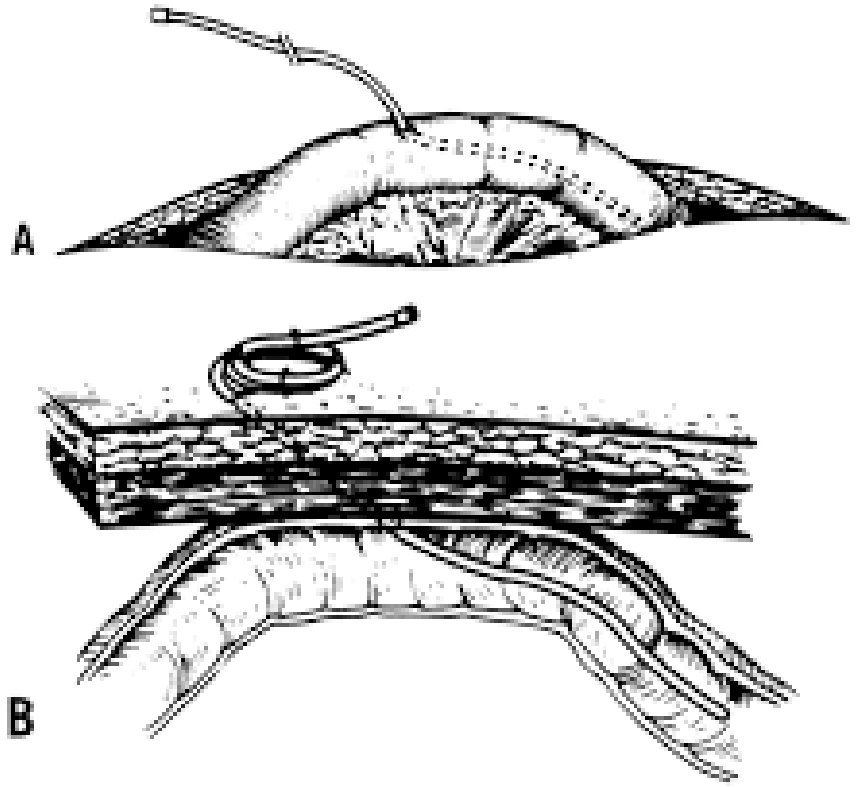
Enteral Nutrition Is Possible After Major Abdominal Trauma



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Enteral Nutrition Reduces Infectious Complications

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THE JOURNAL OF TRAUMA
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Printed in U.S.A.

TEN versus TPN following Major Abdominal Trauma—Reduced Septic Morbidity

FREDERICK A. MOORE, M.D., ERNEST E. MOORE, M.D., TODD N. JONES, R.N.,
BRIAN L. McCROSKEY, M.D., AND VERLYN M. PETERSON, M.D.

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TABLE I
Randomization homogeneity of TEN versus TPN study groups following major abdominal trauma

	TEN (n = 29)	TPN (n = 30)	p value
I. Demographics*			
Age (years)	28 ± 2	32 ± 2	NS
Sex	22M/7F	23M/7F	NS
Blunt trauma	8 (28%)	11 (36%)	NS
Penetrating trauma	21 (73%)	19 (64%)	NS
II. Stress assessment*			
RTS	6.9 ± 0.2	6.9 ± 0.3	NS
ATI	24.7 ± 1.1	24.0 ± 1.0	NS
ISS	28.7 ± 2.3	25.1 ± 1.0	NS
TRISS	0.49 ± 0.05	0.55 ± 0.04	NS
UUN (gm/d)	8.6 ± 0.8	9.4 ± 0.9	NS
BEE (Kcal)	1,641 ± 42	1,731 ± 58	NS

* Mean ± SEM; NS, not significant; RTS, Revised Trauma Score; ATI, Abdominal Trauma Index; ISS, Injury Severity Score; TRISS, probability of survival; UUN, day 1 urinary urea nitrogen; BEE, 24-hr basal energy expenditure.

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Vol. 29, No. 7

TABLE IV
Septic complications of TEN versus TPN study groups following major abdominal trauma

Complications	TEN ($n = 29$)		TPN ($n = 30$)		p value
Major infections					
Abdominal abscess	1	1 (3%)	2	6 (20%)	0.03*
Pneumonia	0		6		
Minor infections					
Wound	3	4 (14%)	1	5 (17%)	NS
Catheter	0		2		
Urinary	0		1		
Miscellaneous	1		2		
Total patients		5 (17%)		11 (37%)	NS

* Fisher's exact test; NS, not significant.

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Enteral *Versus* Parenteral Feeding

Effects on Septic Morbidity After Blunt and Penetrating Abdominal Trauma

KENNETH A. KUDSK, M.D., MARTIN A. CROCE, M.D., TIMOTHY C. FABIAN, M.D., GAYLE MINARD, M.D., ELIZABETH A. TOLLEY, PH.D.,† H. ANDREW PORET, M.D., MELODY R. KUHL, R.N., and REX O. BROWN, PHARM.D.*

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Ann. Surg. • May 1992 Vol. 215 • No. 5

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TABLE 2. *Demographics and Mechanism of Injury*

	ENT (N = 51)	TPN (N = 45)	p
Age (yr)	30.4 ± 1.7	30.6 ± 1.4	NS
ATI	29.1 ± 1.8	29.1 ± 1.4	NS
ISS	25.1 ± 1.7	25.1 ± 1.9	NS
LOS (days)	20.5 ± 2.8	19.6 ± 2.8	NS
Mechanism of injury			
Blunt	16 (31.4%)	10 (22.2%)	NS
Penetrating	35 (68.6%)	35 (77.8%)	NS
Gunshot	30 (58.8%)	29 (64.4%)	NS
Knife	2 (3.9%)	4 (8.9%)	NS
Shotgun	3 (5.9%)	2 (4.4%)	NS

Mean ± SEM.

ENT, enteral; TPN, total parenteral nutrition; ATI, abdominal trauma index; ISS, injury severity score; LOS, length of stay.

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TABLE 4. *Septic Morbidity*

Sepsis	ENT	TPN	p
Pneumonia	6/51 (11.8%)	14/45 (31%)	<.02
Intra-abdominal abscess	1/51 (1.9%)	6/45 (13.3%)	<.04
Empyema	1/51 (1.9%)	4/45 (9%)	NS
Line sepsis	1/51 (1.9%)	6/45 (13.3%)	<.05
Fasciitis/dehiscence	3/51 (5.9%)	4/45 (8.9%)	NS
Abscesses (intra-abdominal and/or empyema)	2/51 (3.9%)	8/45 (17.8%)	<.03
Pneumonia and/or abscesses	8/51 (13.7%)	17/45 (37.8%)	<.02
Pneumonia, abscesses, and/or line sepsis	9/51 (15.7%)	18/45 (40%)	<.02

ENT, enteral; TPN, total parenteral nutrition.

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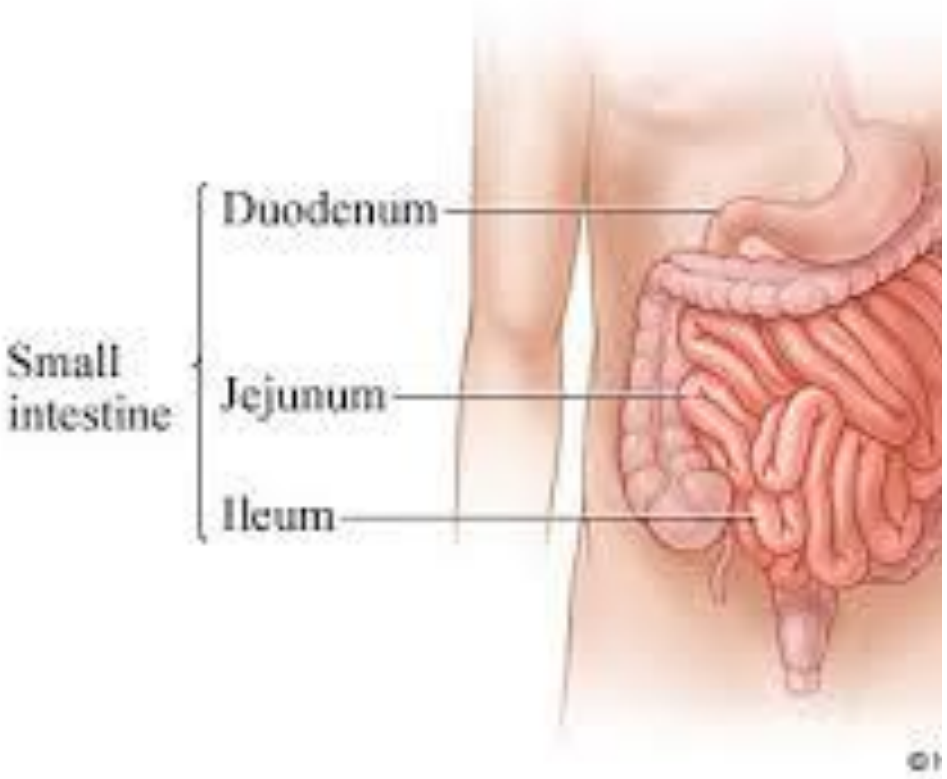

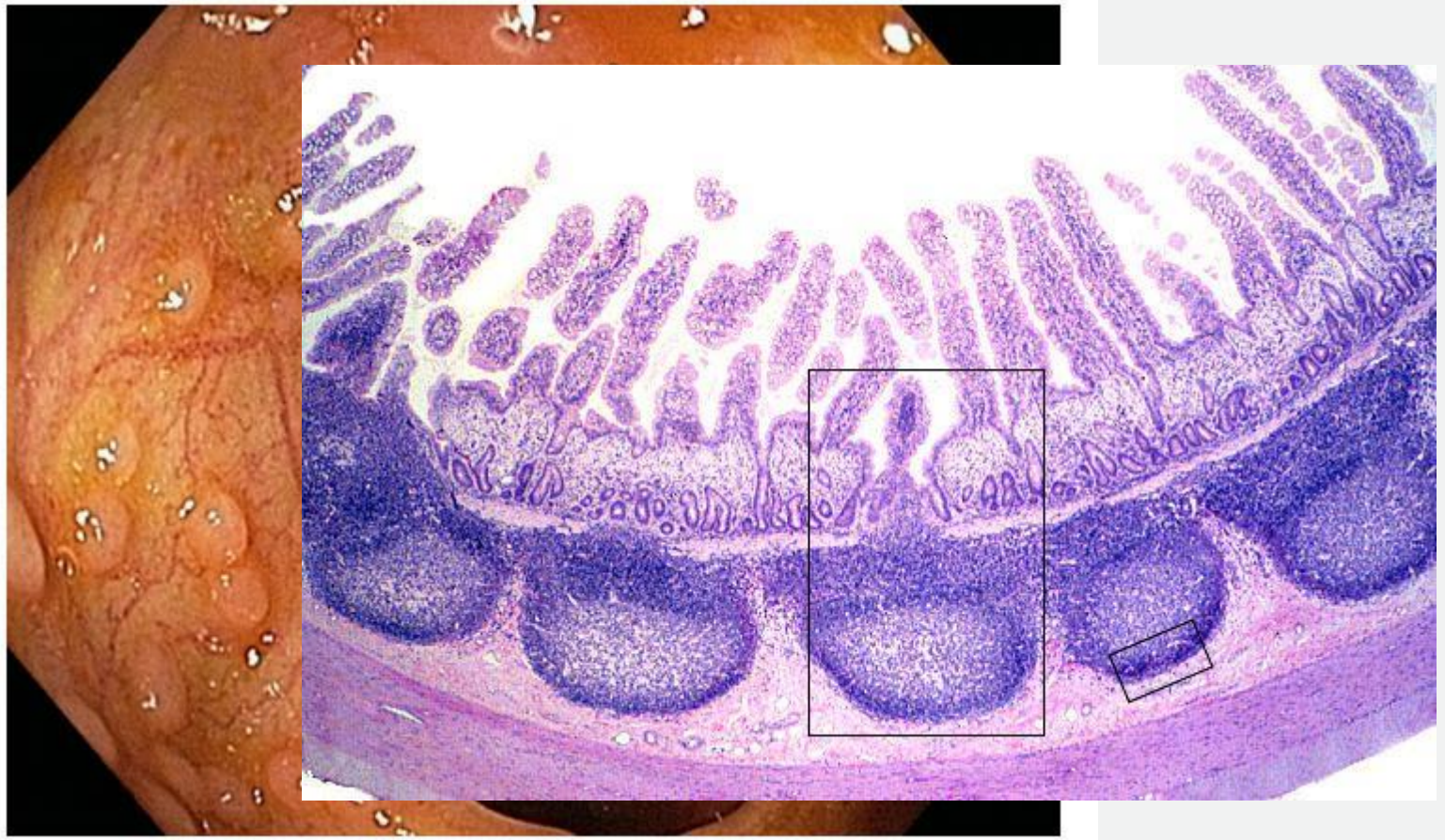

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Early Enteral Feeding Is Better

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THE JOURNAL OF TRAUMA
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Printed in U.S.A.

Benefits of Immediate Jejunostomy Feeding after Major Abdominal Trauma—A Prospective, Randomized Study

ERNEST E. MOORE, M.D., AND TODD N. JONES, B.S.N.

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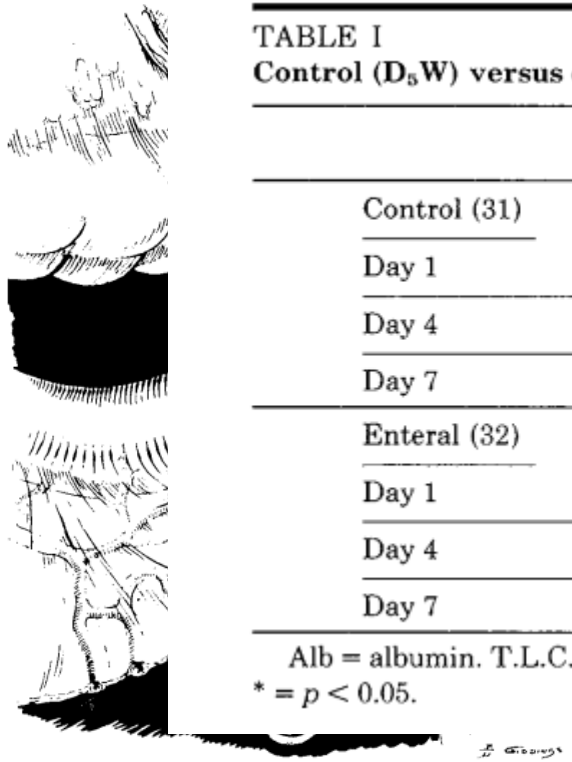

TABLE I
Control (D_5W) versus enteral-fed groups following major abdominal trauma

	Alb. (mg%)	Tran. (mg%)	C.H.I.	T.L.C. (mm^3)	N_2 bal. (gm/day)	Sepsis
Control (31)						
Day 1	3.3 ± 0.1	223 ± 7	115 ± 5	1,408 ± 158	−13.2 ± 0.5	9 (29%)
Day 4	3.1 ± 0.1	187 ± 5	109 ± 3	1,175 ± 176	−11.4 ± 0.7	
Day 7	3.3 ± 0.1	213 ± 9	103 ± 4	1,482 ± 138	−11.1 ± 0.7	
Enteral (32)						
Day 1	3.3 ± 0.1	223 ± 6	124 ± 4	1,831 ± 206	−13.7 ± 0.7	
Day 4	3.2 ± 0.1	184 ± 7	107 ± 6	1,344 ± 166	−3.9 ± 1.6*	3* (9%)
Day 7	3.2 ± 0.1	211 ± 10	105 ± 5	2,054 ± 164*	−5.2 ± 1.2*	

Alb = albumin. T.L.C. = total lymphocyte count. Tran. = transferrin. N_2 bal = nitrogen balance. C.H.I. = creatinine height index. ± = S.E.M., * = $p < 0.05$.

FIG. 1. A needle-catheter jejunostomy was placed at initial laparotomy in patients with an abdominal trauma index > 15 (Reproduced with permission from Moore, E.E.: Needle catheter jejunostomy. *In* Moore, E.E., Eiseman, B., Van Way, C. eds: *Critical Decisions in Trauma*. St. Louis, Mosby, 1985, pp. 564-567).

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Early Enteral Feeding Is Better

Early enteral nutrition reduces mortality in trauma patients requiring intensive care: A meta-analysis of randomised controlled trials

Gordon S. Doig [a,*], Philippa T. Heighes [b], Fiona Simpson [a], Elizabeth A. Sweetman [b]

[a] *Intensive Care, Northern Clinical School, University of Sydney, Sydney, NSW 2006, Australia*
[b] *Royal North Shore Hospital, Intensive Care Unit, St. Leonards, NSW 2065, Australia*

Injury, Int. J. Care Injured 42 (2011) 50–56

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Early Enteral Feeding Is Better

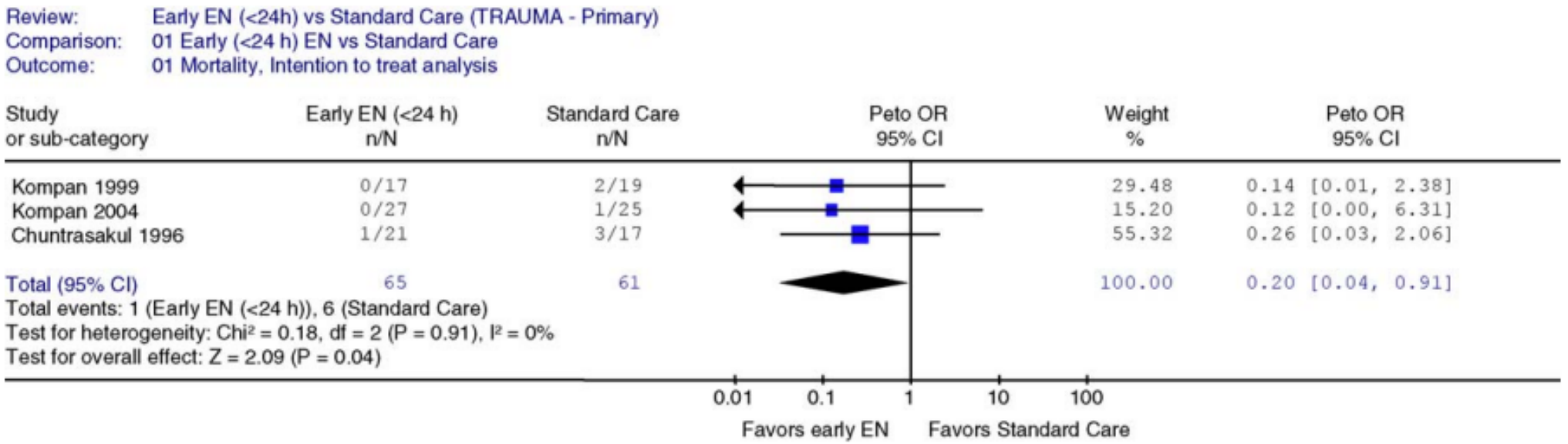

Fig. 2. Primary analysis of trials reporting intention-to-treat mortality. CI = confidence interval, EN = enteral nutrition, OR = odds ratio.

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Trauma Patients Are Hungry and We Have To Feed Them

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- Enteral feeding is better than TPN
  - Decreased infectious complications

- Start enteral nutrition as fast as safely possible
  - Less than 24 hours from presentation

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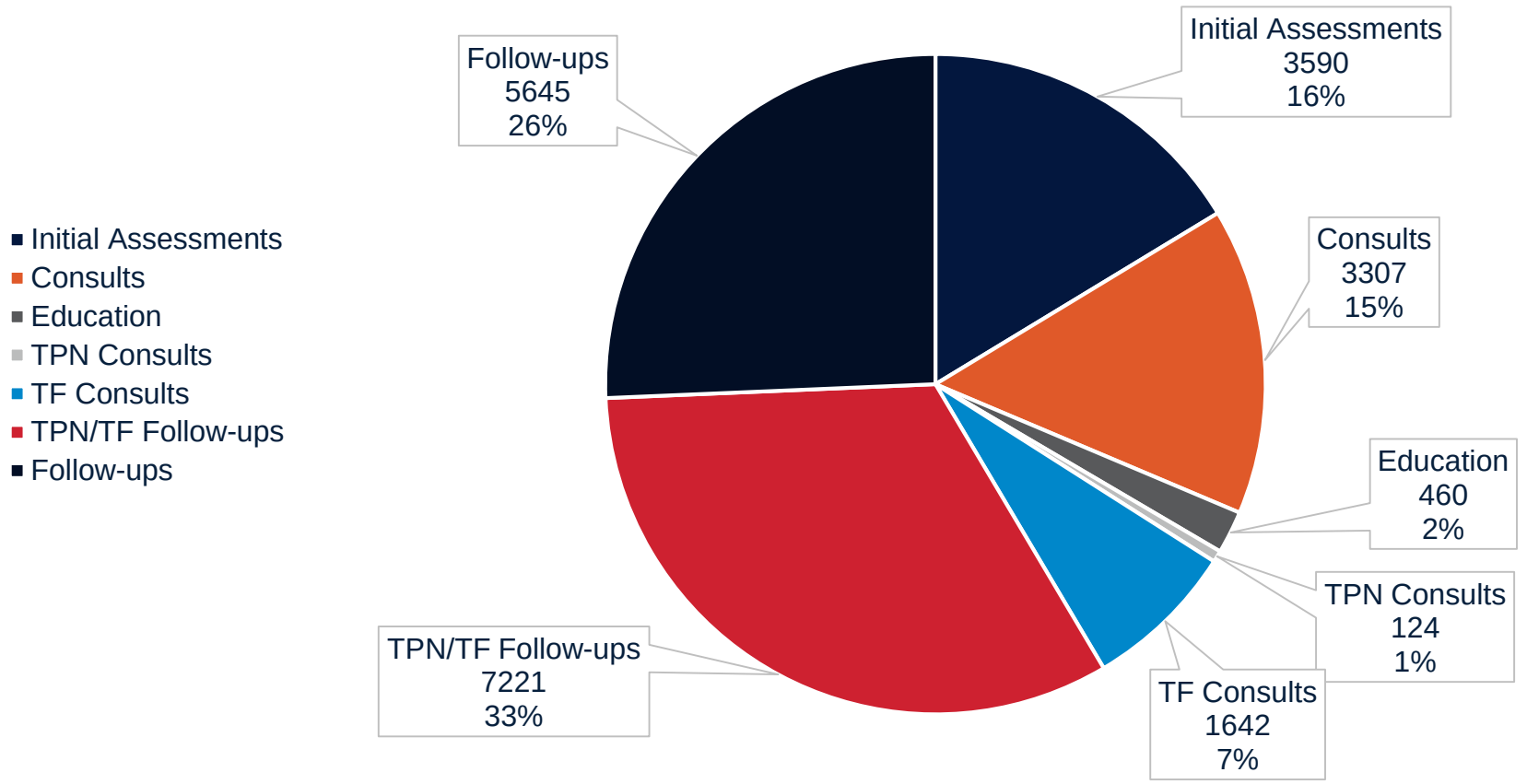
Annual Number of Clinical Nutrition Patients - Skyline



Total Patients: 21,989

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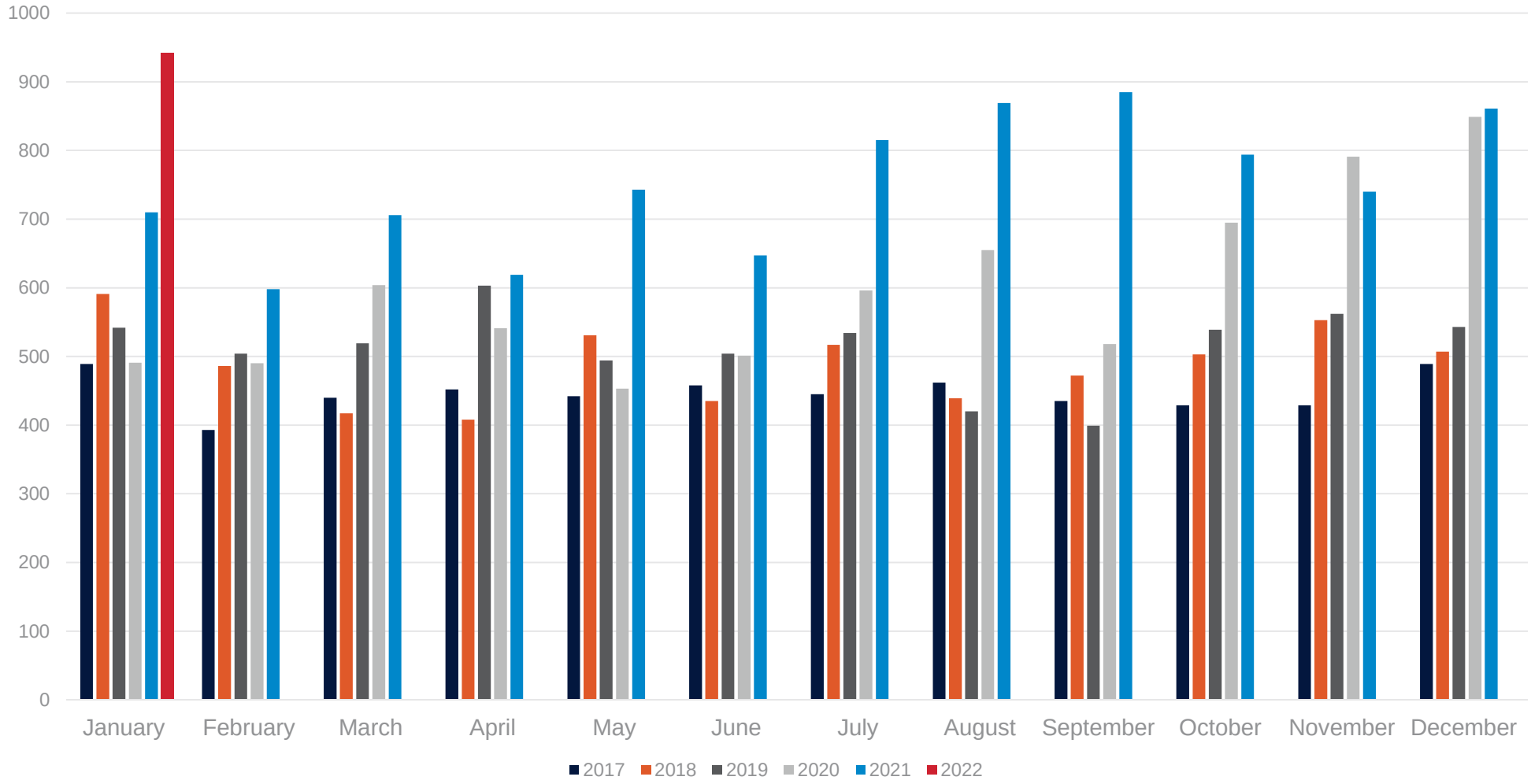
Monthly Nutrition Support RD Visits



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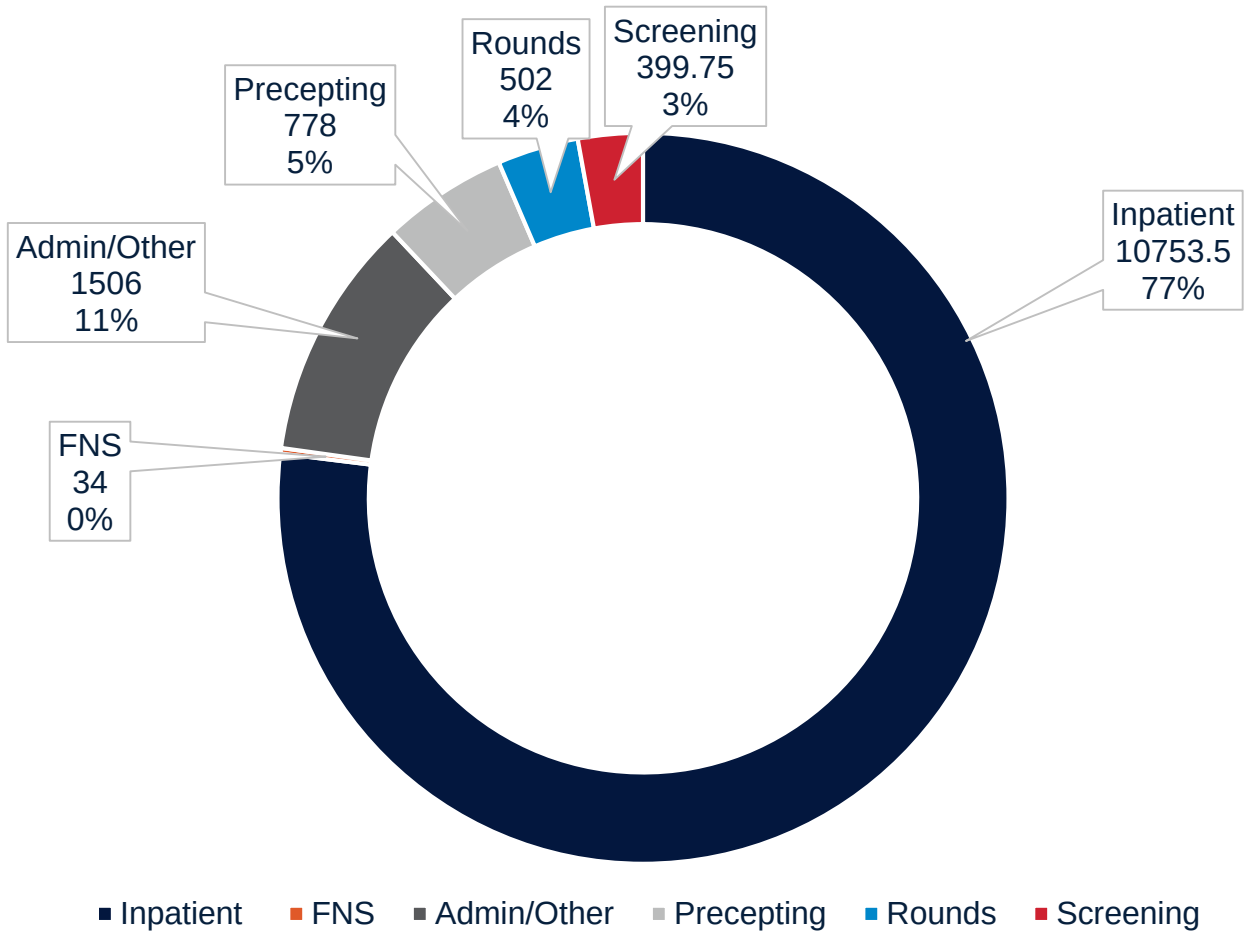
Breakdown of RD Time – Skyline



Total Time Worked: 13,973.25 hours at Skyline

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Indications for Enteral Nutrition (EN) Support

- **Inability to eat**
  - Neurologic disorders, facial/oral/esophageal trauma, congenital abnormalities, respiratory failure/vented patients, TBI, GI surgery
- **Inability to eat adequately**
  - Hyper-metabolic, high energy requirements (burns, cancer, cystic fibrosis)
- **Impaired digestion, absorption, need for special formula or supplemental feeds**
  - Crohn's disease, SBS w/ minimal resection, pancreatitis

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Contraindications for EN Support

- Gastrointestinal obstruction
- Intractable vomiting/diarrhea
  - That is unable to be medically treated
- Severe SBS
  - <100 cm of small bowel remaining
- Distal high output fistula
- Severe GI bleed
- Severe malabsorption
- Inability to gain access to GI tract
- Aggressive interventions not desired

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Benefits of EN

- Most physiologic route for nutrition
- Safer and reduces infection rate
  - Maintains gut integrity through trophic simulation
  - As little as 10-30 mL/hour decreases bacterial translocation
  - No direct blood access by bacteria (ex: PICC line)
- Cheaper!
  - $25/day vs $200-1000/day for Parenteral Nutrition
- General Rule: If the gut works, USE IT!

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EN Access

- Depends on several factors
  - Anticipated length of time
  - Risk for aspiration
  - Presence or absence of normal digestion

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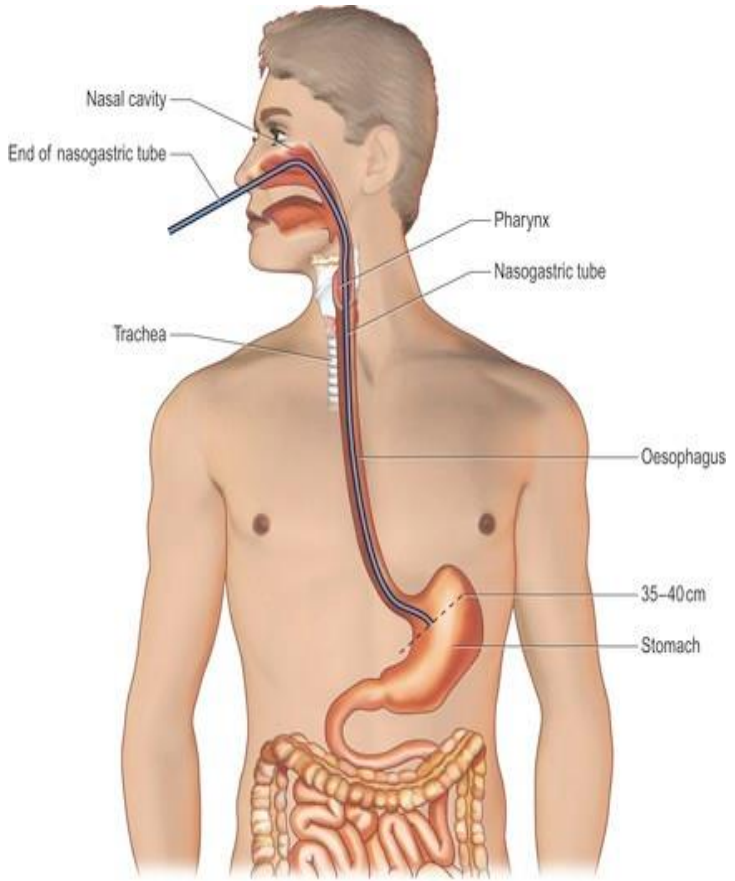
Types of Feeding Tubes

- **Orogastric:** mechanically ventilated patients or adults with trauma to sinus area
- **Nasogastric:** if feeding <1-2 weeks
  - Most common at SLMC



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Types of Feeding Tubes: Nasoenteric

- **Nasogastric (NGT)**
  - Normal GI function
  - Continuous, intermittent, or bolus (not typically done)
  - SBFT (Cortrak, Dobhoff)
  - NGT for gastric suction/decompression
- **Nasoduodenal or Nasojejunal (NJ)**
  - Short term
  - Gastric motility disorders, esophageal reflux, persistent nausea / vomiting
  - Intermittent or continuous infusion
  - Bolus is not recommended

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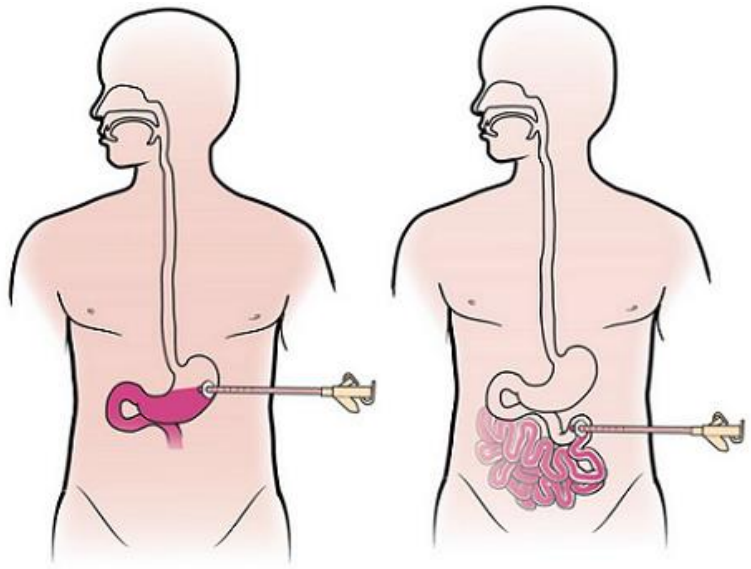
Types of Feeding Tubes

- **Enterostomy:** when nasoenteric placement is not possible or TF needed for >3-4 weeks
  - Gastrostomy: open G-tube, PEG
  - Jejunostomy: J-tube, PEJ, G-J tube



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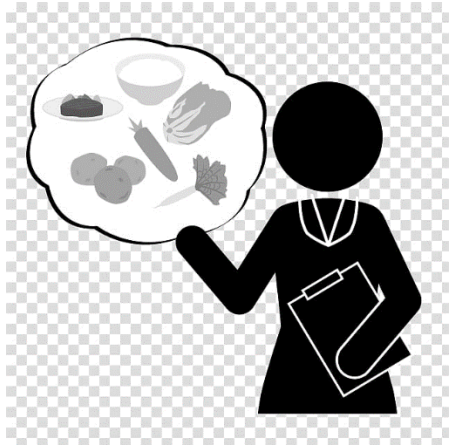
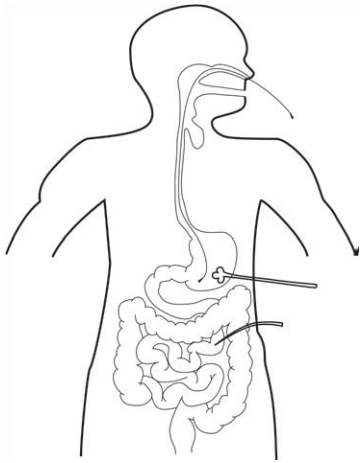


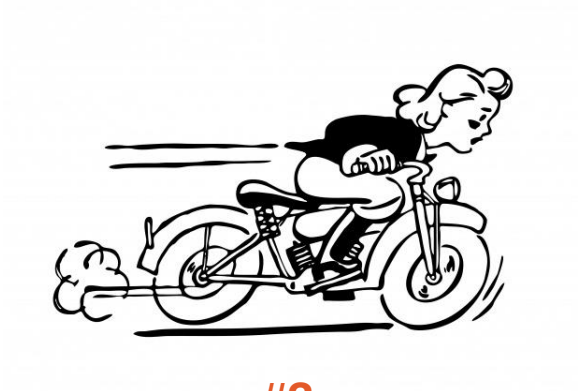
#1

Trauma patients require nutrition for increased chances of survival



#2

Enteral nutrition is the preferred source over parenteral nutrition - if the gut works, use it!



#3

Nutrition should be delivered as soon as possible

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Safe Start

- Easily tolerated, high-protein, fiber free tube feed option
  - 1.0 kcal formula at a trickle rate of 20 ml/hr

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Hypothesis

- With the utilization of Safe Start, there will be a decrease in the average time from order entry to tube feed initiation in comparison to regular tube feeding consults from patients seen in Trauma Services

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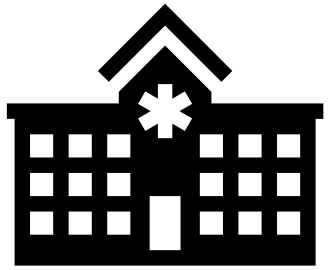
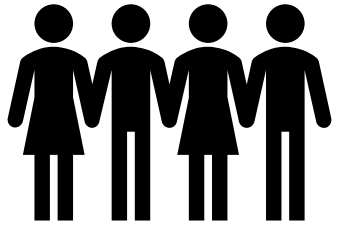
Methods



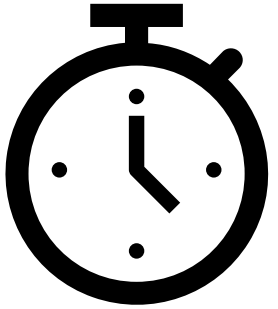
Background:

Safe Start was piloted at TriStar Skyline Medical Center – Spring 2021



Patient Population:

Retrospective analysis of all trauma patients admitted to Trauma Services requiring tube feeding consults via Dobhoff or nasogastric tubes during spring of 2021



Primary Outcome:

Time from order entry to initiation of enteral feeds

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Results: Characteristics

- N = 21 patients
  - Admitted from 4/1/2021 – 5/19/2021
- Inclusion: Trauma service patients requiring tube feeding; dietitian consults entered by trauma providers
- Exclusion: non- Safe Start TF orders (N= 11)

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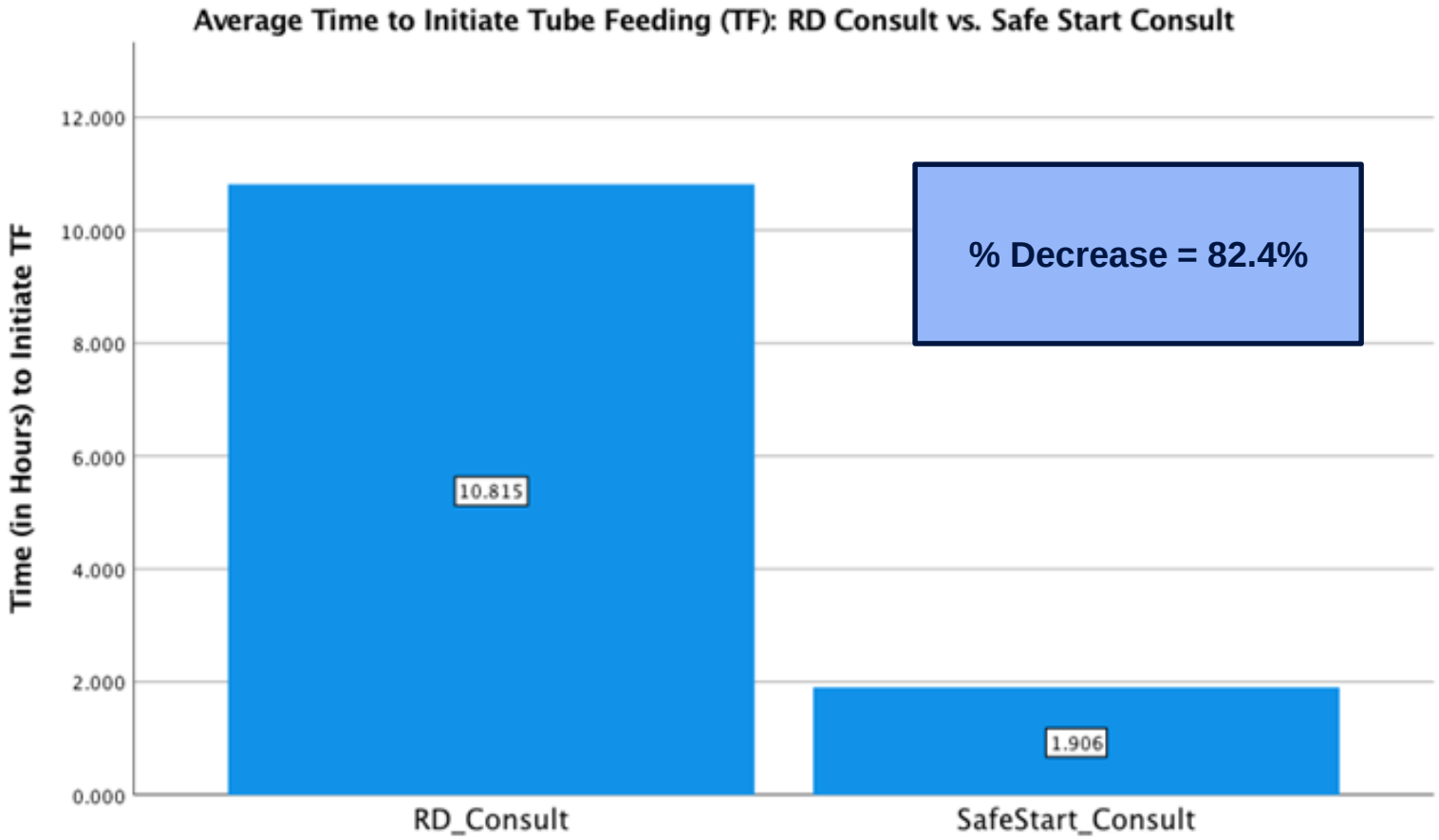
Results



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Limitations

- Pilot study
  - Limited time frame
  - Small sample size
- Neuro and medical ICU not included

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Discussion

- Addressed gaps in current TF processes
  - Identified need for a volume based TF protocol
- Continued education to trauma nursing professionals
- Future studies on secondary outcomes
  - LOS
  - Morbidity & mortality
  - Infectious complications
  - Post-pyloric DHT – PNA reduction

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Conclusion

- Clinical nutrition is essential for the overall well-being of trauma patients
- Early enteral tube feeding programs are supported by the findings
- Increased awareness and education on clinical nutrition is needed

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Thank You

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