

The Role of the Gastroenterologist in an *Integrated Nutrition Pathway for Acute Care*

A Case Based Discussion

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Leah Gramlich MD

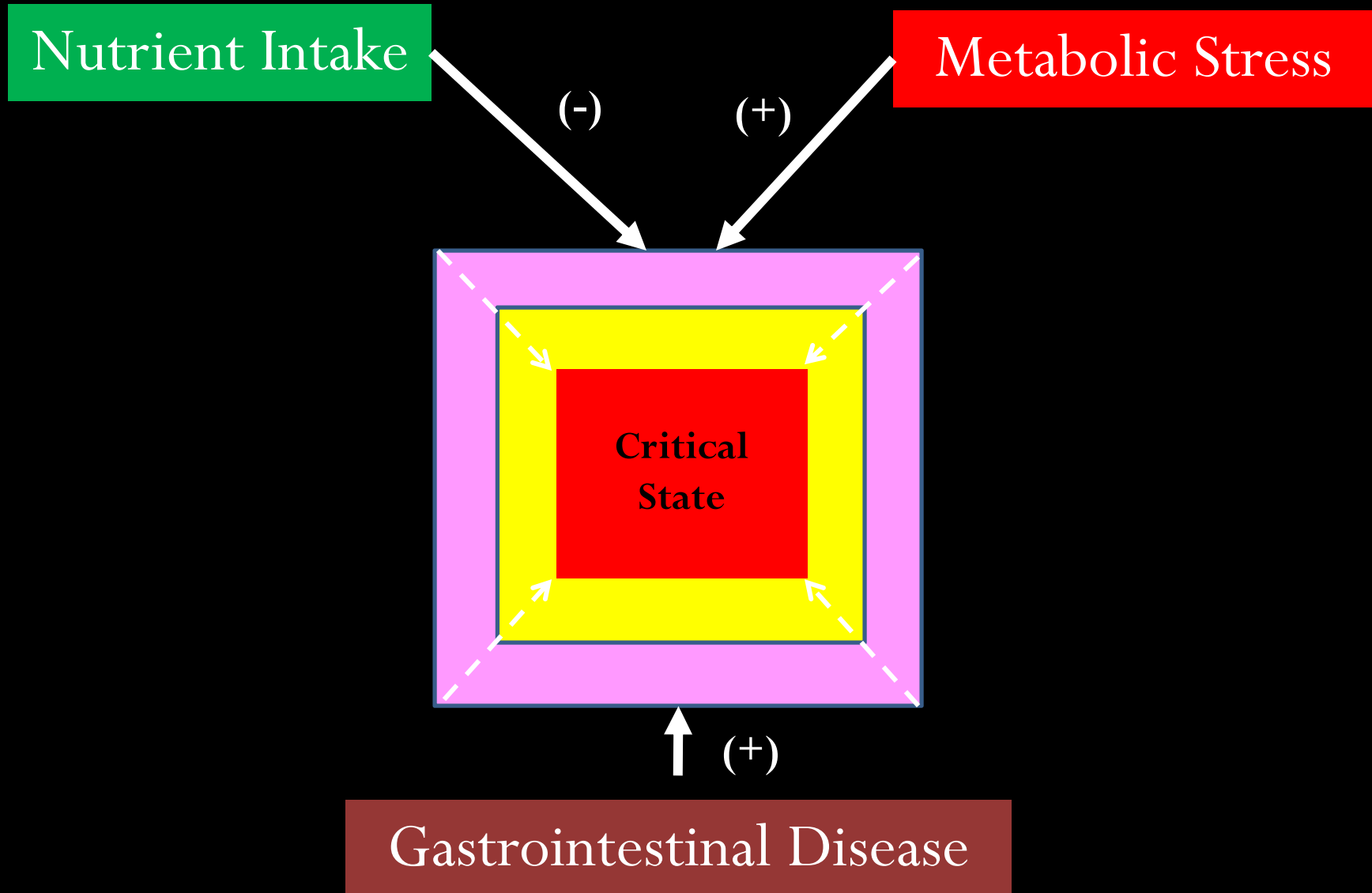
Conflict of Interest

- Dr. K. Jeejeebhoy
Abbott Canada – Speakers Bureau
Baxter Canada – Speakers Bureau
Shire – Consultant, Research Support
- Dr. Leah Gramlich
Abbott Canada – Speakers Bureau
Baxter Canada – Speakers Bureau
Shire - Consultant

Learning Objectives

- Describe an approach to Integrating Nutrition Care in hospitalized patients (INPAC)
- Detail strategies to address nutrition care in
 - Well nourished
 - Risk for Malnutrition
 - Severely Malnourished
- Discuss the role of the gastroenterologist
- Describe the expected outcomes of nutrition care in heterogeneous populations

Nutritional State



Nutrition in Medical Care

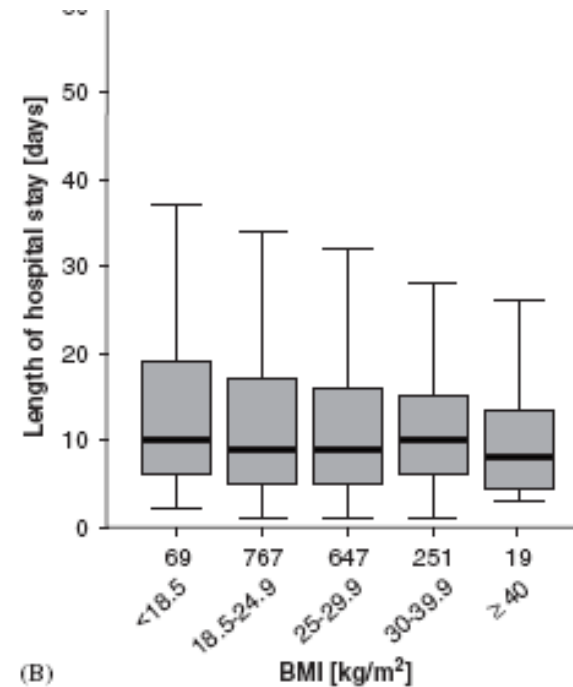
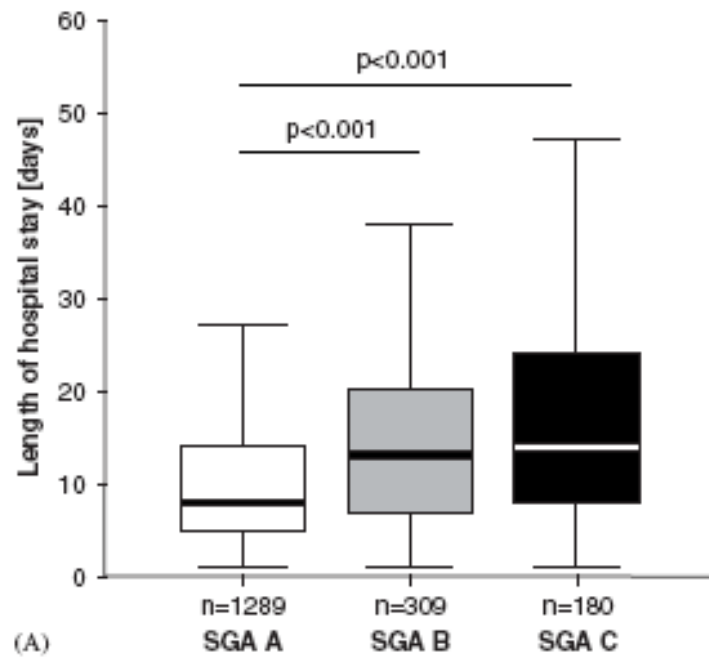
- Subjective Global Assessment (SGA)
 - Beside clinical evaluation
 - Composite assessment of factors influencing Nutritional Status
 - Nutrient intake
 - Gastrointestinal function
 - Disease effect on metabolic requirements
 - Evaluates Severity of the effects of these factors
 - Trajectory and persistence of weight loss
 - Reduction of function
 - Reproducible and identifies patients who benefit from Nutritional Therapy

The German Hospital Malnutrition Study. Pirlich et al. Clinical Nutrition 2006

SGA in 1886 consecutive admissions

1073 in 7 University Hospitals

813 in 6 Community Hospitals



Subjective global assessment: a simple and reliable screening tool for malnutrition among Indians

M Shirodkar, K M Mohandas

Table 2: Association between malnutrition scores and postoperative outcomes

Outcome variable	Pre-operative malnutrition scores			<i>p</i>
	Nil-Mild	Moderate	Severe	
Body mass index (Kg/m ²)	>20	18.5-20	<18.5	
Number of patients	103	53	110	
Adverse events (#)	12	9	12	0.52*
30-day mortality (#)	0	2	2	0.18*
Prolonged stay (#)	30	14	31	0.98*
Median postoperative days	6.0	7.0	6.0	0.19@
Median antibiotic days	6.0	7.0	6.0	0.12@
<i>Subjective Global Assessment Scores</i>				
	A	B	C	
Number of patients	152	98	16	
Adverse events (#)	12	17	4	0.025*
30-day mortality (#)	0	3	1	0.042*
Prolonged stay (#)	39	27	9	0.019*
Median postoperative days	5.0	7.0	10.0	0.000@
Median antibiotic days	6.0	6.0	10.0	0.000@

**chi*-squared test for trend

@Kruskal-Wallis H equivalent of *chi*-square for trend

SUBJECTIVE GLOBAL ASSESSMENT (MD, RD)

SGA A - Well Nourished

- No weight loss or deficit in nutrient intake
- No gastrointestinal symptoms impacting nutrition
- Normal functional status
- Normal subcutaneous fat and muscle mass
- Improving findings of malnutrition.

SGA B – Moderately Malnourished

- 5-10 % weight loss in the past 6 months.
- Definite decrease in oral intake.
- Gastrointestinal symptoms impacting nutrition.
- Moderate functional deficit or recent decline.
- Mild to moderate subcutaneous fat and muscle mass loss on physical examination

SGA C – Severely Malnourished

> 10 % weight loss in the past 6 months.

Severe decrease in oral intake; Gastrointestinal symptoms impacting nutrition

Severe functional deficit.

Severe deficit of subcutaneous fat and muscle loss on physical examination

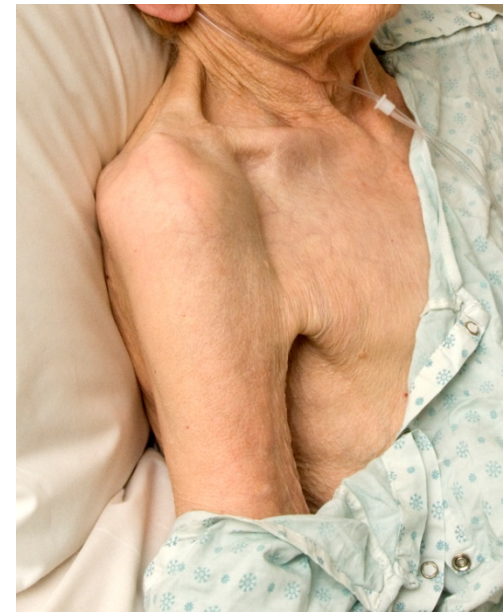
Nutritional Assessment: Subjective Global Assessment



SGA-A: Well Nourished



SGA-B: At risk for malnutrition



SGA-C: Severely Malnourished

Nutritional assessment: comparison of clinical assessment and objective variables for the prediction of length of hospital stay and readmission

Khursheed N Jeejeebhoy, Heather Keller, Leah Gramlich, Johane P Allard, Manon Laporte, Donald R Duerksen, Helene Payette, Paule Bernier, Elisabeth Vesnaver, Bridget Davidson, Anastasia Teterina, and Wendy Lou
AJCN 2015

TABLE 9

Multiple logistic model combining 3 nutrition indicators to predict the outcome of length of stay <7 d vs. ≥ 7 d ($n = 699$)¹

Variable	OR (95% CI)	<i>P</i> value
HGS continuous, kg	0.98 (0.97, 0.996)	0.01
SGA B/C vs. SGA A	1.51 (1.11, 2.05)	0.009
Food intake <50%	1.44 (1.04, 2.00)	0.03

¹HGS, handgrip strength; SGA A, subjective global assessment, well nourished; SGA B, subjective global assessment, mildly/moderately malnourished; SGA C, subjective global assessment, severely malnourished.

Three month intervention with protein and energy rich supplements improve muscle function and quality of life in malnourished patients with non-neoplastic gastrointestinal disease—A randomized controlled trial

Norman et al. Clinical Nutrition 2008, 27;48-56

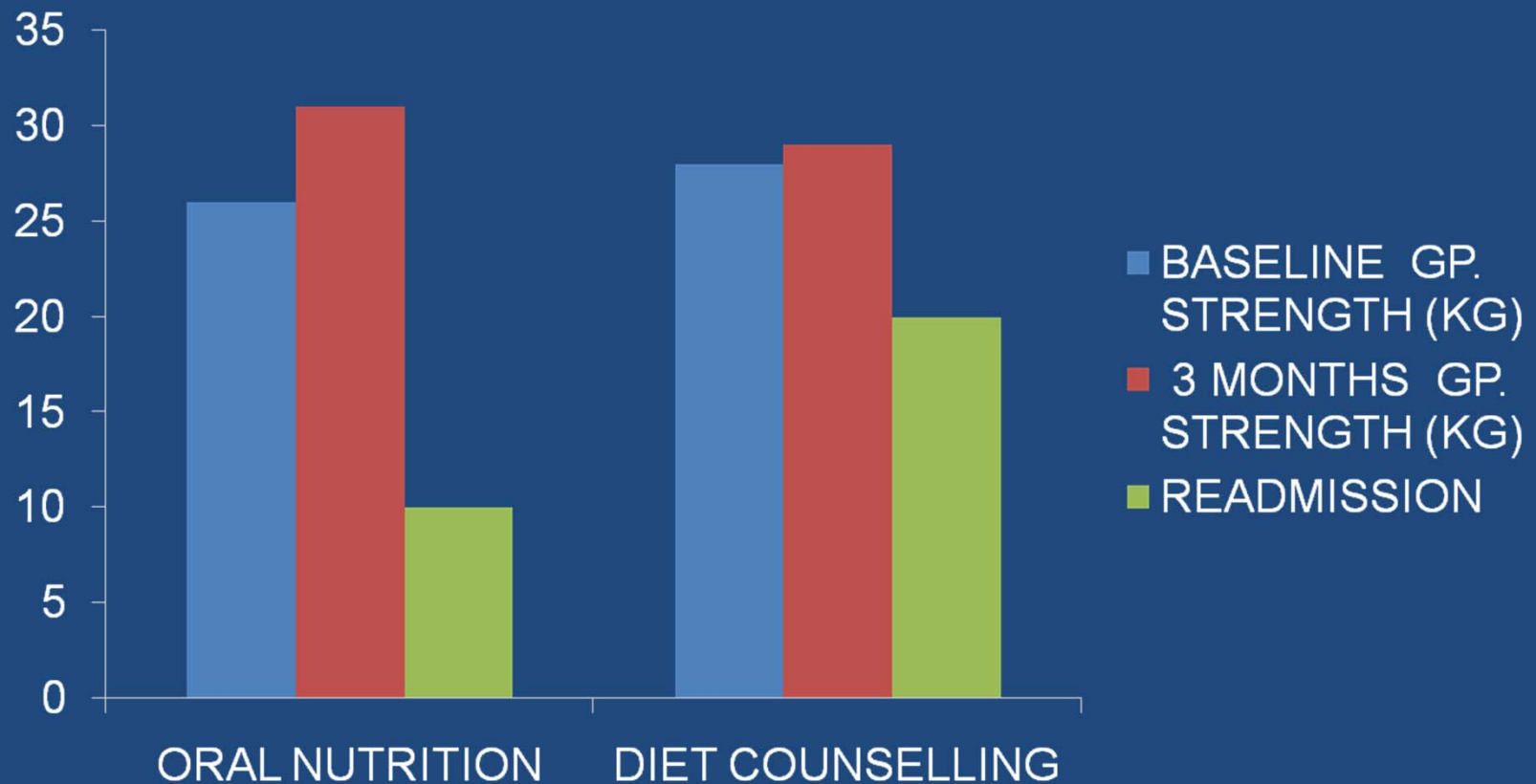
Table 1.

Diagnoses of study patients recruited in hospital.

	ONS (n=48)	DC (=53)
Liver cirrhosis:	12	15
Crohn's disease:	11	11
Ulcerative colitis:	11	8
Gastritis:	3	5
Biliary disease:	4	4
Chronic pancreatitis:	2	3
Other colorectal disease:	2	4
Other liver disease:	1	2
Achalasia:		1
Dumping syndrome:	1	
Sclerodermia:	1	

Refeeding SGA B+C Patients with GI Disease

Norman Clin Nutr 2008



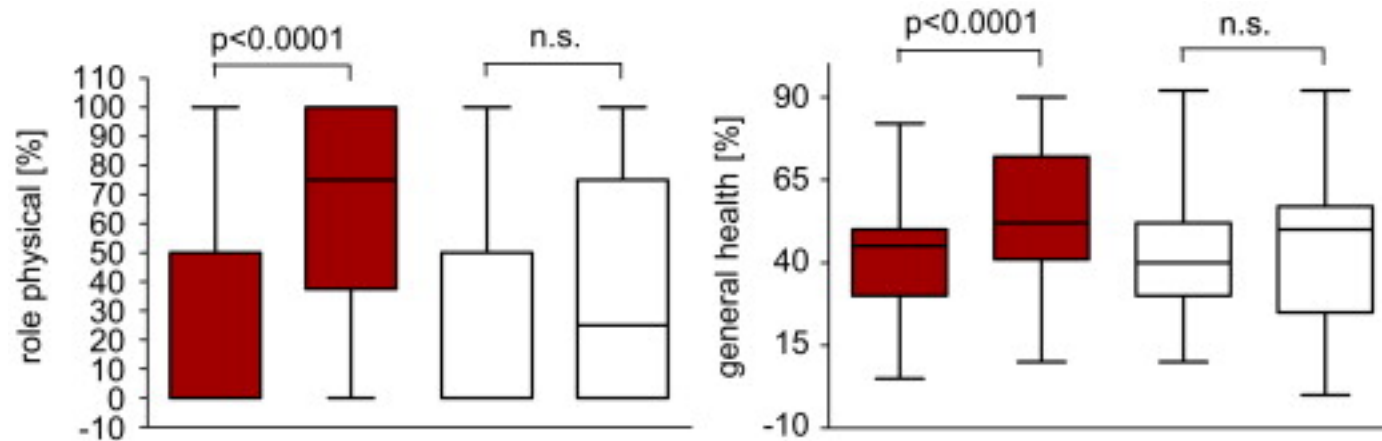


Figure 4. Change of the SF 36 scales role physical and general health during the study period. Data presented as box plot. The box plots display the minimum, the maximum and the 25th, 50th and 75th percentiles.

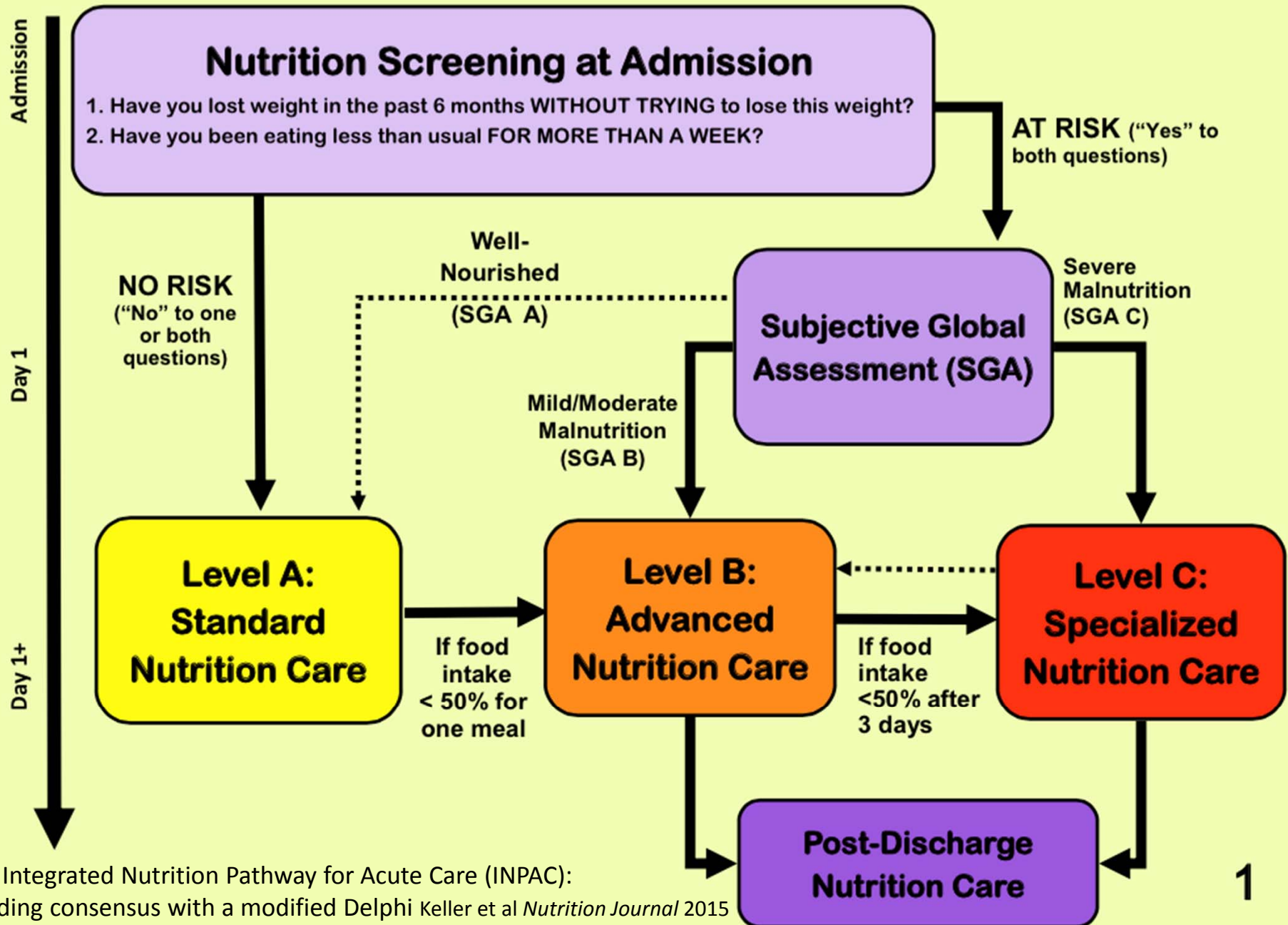
Kristina Norman, Henriette Kirchner, Manuela Freudenreich, Johann Ockenga, Herbert Lochs, Matthias Pirlich

Three month intervention with protein and energy rich supplements improve muscle function and quality of life in malnourished patients with non-neoplastic gastrointestinal disease—A randomized controlled trial

Clinical Nutrition, Volume 27, Issue 1, 2008, 48–56

<http://dx.doi.org/10.1016/j.clnu.2007.08.011>

Integrated Nutrition Pathway for Acute Care (IN-PAC)*



The Integrated Nutrition Pathway for Acute Care (INPAC):
Building consensus with a modified Delphi Keller et al *Nutrition Journal* 2015

*IN-PAC is an evidence-based pathway for medical and surgical patients

See Page 2 for further detail

Mrs. JS: 42 yo female

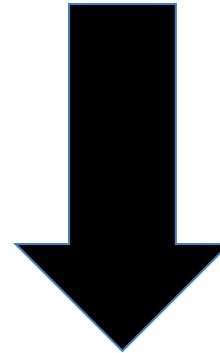
- CC: abdominal pain
- HPI: RUQ pain off and on for 6 months
 - associated with nausea, early satiety
- No weight change
- No reduction in oral intake



Patients **NOT** at risk of
malnutrition

This is a minimum
Standard Nutrition Care
provided to **ALL** patients.

This *Standard Nutrition
Care* promotes food intake
and monitoring of the
patient so that challenges
to food consumption can
be identified readily and
treated.



**Level A:
Standard
Nutrition
Care**

Mrs. JS

Consider the Role of the Gastroenterologist in Nutrition Care...

- PMH – Diabetes, HTN, Dyslipidemia
- Ht – 166 cm Wt- 100 kg BMI – 36
- P/E – no features of lean tissue or fat loss
- Labs: Alk Phos – 379, AST-502, Bili – 48 TG-1.8
Glu-12 WBC-12 HCT – 39 Lipase – 230
- U/S: fatty liver, cholelithiasis, CBD=12 mm
- CT: mild acute pancreatitis

Level A: Standard Nutrition Care

Nutrition Care is Everyone's responsibility

LEVEL A: Standard Nutrition Care:

- Sit patient in chair or position upright in bed
- Ensure vision and dentition needs are addressed
- Address nausea, pain, constipation
- Ensure food is available at all times
- Monitor & Report:
 - Food intake 2x/week
 - Duration of NPO/clear fluid intake
 - Hydration status
 - Weekly weights
- Ensure bedside table is cleared for tray set-up, open packages, provide assistance to eat
- Monitor for signs of dysphagia
- Encourage family to bring preferred foods from home

MD - Natural history of presenting illness?

- Need/rationale for NPO?
- Pain and Symptom Control?
- Impact of Investigations?
- Impact of Treatment?

Mrs. JS

Consider the Role of the Gastroenterologist in Nutrition Care...

- Do you feed this patient?
- Are there any restrictions?
- What strategies and symptoms would you focus on in order to enhance oral intake?
- Metabolic Syndrome and NAFLD – What is your role during this admission?

Mr. DC: 66 yo male

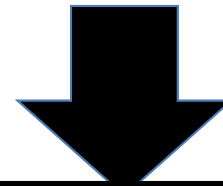
- CC: Crohns' disease, 3 previous resections
 - increasing symptoms despite Remicade with adequate trough levels
- HPI: 6 months worsening symptoms including abdo pain, reduced bowel movements
- Weight loss: UBW=80 kg, Ht=175cm CBW=73kg
BMI = 24.8
- Oral intake reduced for 3 weeks



Patients at SGA B or Level A with <50% food intake

Continue **Level A:**
Standard Care
AND

provide more nutrient
dense food to patients at
meals and between meals
to optimize oral intake.



**Level B:
Advanced
Nutrition
Care**

MD: - Natural History of Disease?

- Need/rationale for NPO?
- Pain and Symptom Control?
- Impact of Investigations?
- Impact of Treatment?
- Short-term and Long-term impact of disease?

LEVEL B: Advanced Nutrition Care:

Continue **Standard Nutrition Care** practices **AND**

- Assess & address other barriers to food intake
- Monitor food intake at least 1 meal/day
- Promote intake with one or more of:
 - Nutrient dense diet (high in energy, protein, micronutrients)
 - Liberalized diet
 - Preferred foods
 - High energy/protein shakes/drinks
 - Snacks available between meals

Nutrition Care is Everyone's Responsibility!

Mr. DC

Consider the Role of the Gastroenterologist in Nutrition Care...

- P/E – subtle features of lean tissue and fat loss
- CT abdomen: incomplete SBO with thickening of neo-terminal ileum
- Endoscopy: neo-TI 8mm
- CTE: no fistulae; 2 cm stricture at ileocolic anastamosis
- Labs: WBC=9 Hbg=102 (N/N, increased RDW) pre-alb = 0.0745 (N= 0.25-0.09) B12=148
- Monitored Oral Intake – texture modified dietary intake (full fluids); consuming 2 ONS/d plus 500 cc of clear fluids
- Fasted 4/7 days since admission

What do you need to do to support Mr.DC?

Consider the Role of the Gastroenterologist in Nutrition Care...

- ?consult the dietitian?
- Ensure patient is not NPO?
- Treat Crohns' disease?
- What is the role of IV Fluid?
- Initiate non-volitional feeding? – EN/PN
- Ask: What is the goal/impact of my IBD therapy?
What is the goal of my nutrition therapy?
Short-term? Long-term?
- The role of the gastroenterologist includes diagnosing and treating underlying disease and prioritizing and implementing a Nutrition care plan in those at risk!

Table 2 Changes in nutritional parameters during the study period.

	ONS patients (<i>n</i> = 38)			DC patients (<i>n</i> = 42)			ONS patients	DC patients	
	Baseline	3 Months	<i>P</i>	Baseline	3 Months	<i>P</i>	Differences		<i>P</i>
<i>Nutritional parameters</i>									
Weight (kg)	60.5±12.9	63.6±12.6	0.001	65.5±13.7	67.6±12.9	0.023	3.1±6.1	2.2±5.8	n.s.
BMI (kg/m ²)	20.9±3.9	21.9±3.9	0.001	22.4±3.9	23.1±3.5	0.023	1.1±2.1	0.7±1.9	n.s.
BCM (kg)	20.8±6.0	22.2±6.2	<0.0001	21.7±6.3	22.5±6.4	0.001	1.4±2.1	0.9±1.7	n.s.
Phase angle (°)	4.5±1.3	4.9±1.1	0.028	4.7±1.0	4.7±1.1	n.s.	0.34±0.91	0.05±0.66	n.s.
AMA (mm ²)	3798.6±1242.4	4201.6±1211.6	0.004	3879.4±1130.1	4322.4±1149.3	0.006	400.8±680.6	442.4±994.1	n.s.
AFA (mm ²)	1360.0±928.3	1639.6±1084.5	0.002	1767.5±964.2	1886.1±861.6	n.s.	269.3±421.0	176.0±641.0	n.s.
<i>Muscle function parameters</i>									
Hand grip strength (kg)	26.1±11.3	31.5±10.1	<0.0001	28.3±10.2	29.3±11.6	n.s.	5.4±6.9	1.0±4.5	0.002
Peak flow (l/min)	329.2±124.0	388.9±108.4	0.004	353.6±132.2	365.7±128.9	n.s.	57.6±105.7	15.0±72.4	0.047

Abbreviations: BMI, body mass index; BCM, body cell mass; PA, phase angle; AMA, arm muscle area; AFA, arm fat area; HGS, hand-grip strength; PF, peak flow.

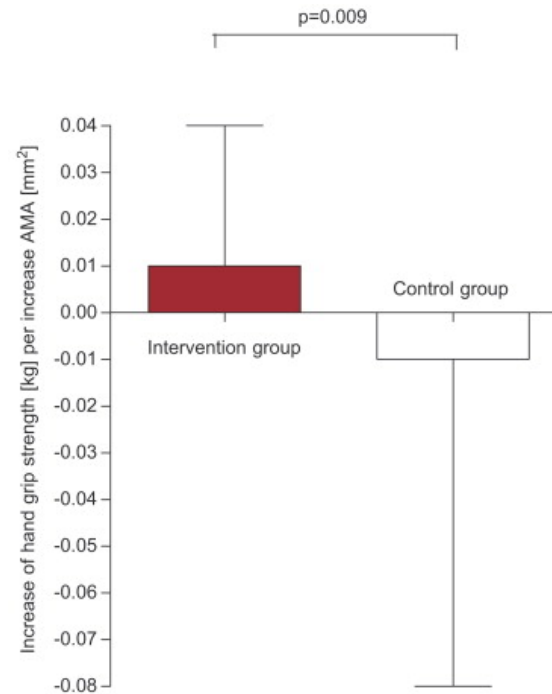


Figure 3. Change in hand-grip strength per AMA increase is significantly greater in ONS patients than in DC patients. Data given as mean and STD.

Kristina Norman, Henriette Kirchner, Manuela Freudenreich, Johann Ockenga, Herbert Lochs, Matthias Pirlich

Three month intervention with protein and energy rich supplements improve muscle function and quality of life in malnourished patients with non-neoplastic gastrointestinal disease—A randomized controlled trial

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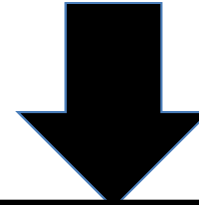
<http://dx.doi.org/10.1016/j.clnu.2007.08.011>

Mr. NJ: 72 yo male

- CC: Dysphagia
- HPI: 3 months progressive difficulty swallowing
- Weight loss: UBW=100kg, Ht=180cm
CBW=82kg BMI=25.3
- Reduction in oral intake over 3 weeks – able to take only soft solids and liquids



Patients at SGA C or Level B with
<50% food intake after 3 days



A comprehensive dietitian assessment is the basis for **Level C: Specialized Nutrition Care**. This should occur within 24 hours of completion of the SGA or after 3 days of low food intake for those originally designated as Level B.



MD: - Natural History of Disease?

- Need/rationale for NPO?
- Pain and Symptom Control?
- Impact of Investigations?
- Impact of Treatment?
- Short-term and Long-term impact of disease?
- Goals of Care?

Mr. NJ

Consider the Role of the Gastroenterologist in Nutrition Care...

- P/E – Loss of fat and lean tissue
- Endoscopy – obstructing esophageal cancer
- CT chest/abdomen – crural lymphadenopathy
- Labs: WBC=6 Hbg=122 Albumin=29
- ?Grip Strength
- NPO 3 days for tests; able to swallow 500 ml/d
- Consultation with oncology, surgery 6-8 days post admit

LEVEL C: Specialized Nutrition Care:

Where appropriate, **Standard & Advanced Nutrition Care** strategies should be continued. Patient will undergo a Comprehensive Nutrition Assessment completed by the dietitian. This involves:

- More detailed assessment of nutrition status using physical examination, anthropometry, dietary, clinical, and biochemical markers
- Further identification of barriers to food intake (e.g. swallowing ability)
- Identification of eating behaviours that will support food intake
- Individualized treatment and monitoring

Nutrition Care is Everyone's Responsibility!

Mr. NJ

Consider the Role of the Gastroenterologist in Nutrition Care...

- How high on your priority list is nutrition?
- What are your therapeutic options: EN, PN, Stent, ONS?
- When do you initiate nutrition care?
- How do you define goals for feeding and nutrition?

From: **Nutritional Support and Outcomes in Malnourished Medical Inpatients: A Systematic Review and Meta-analysis**

JAMA Intern Med. 2016;176(1):43-53. doi:10.1001/jamainternmed.2015.2111

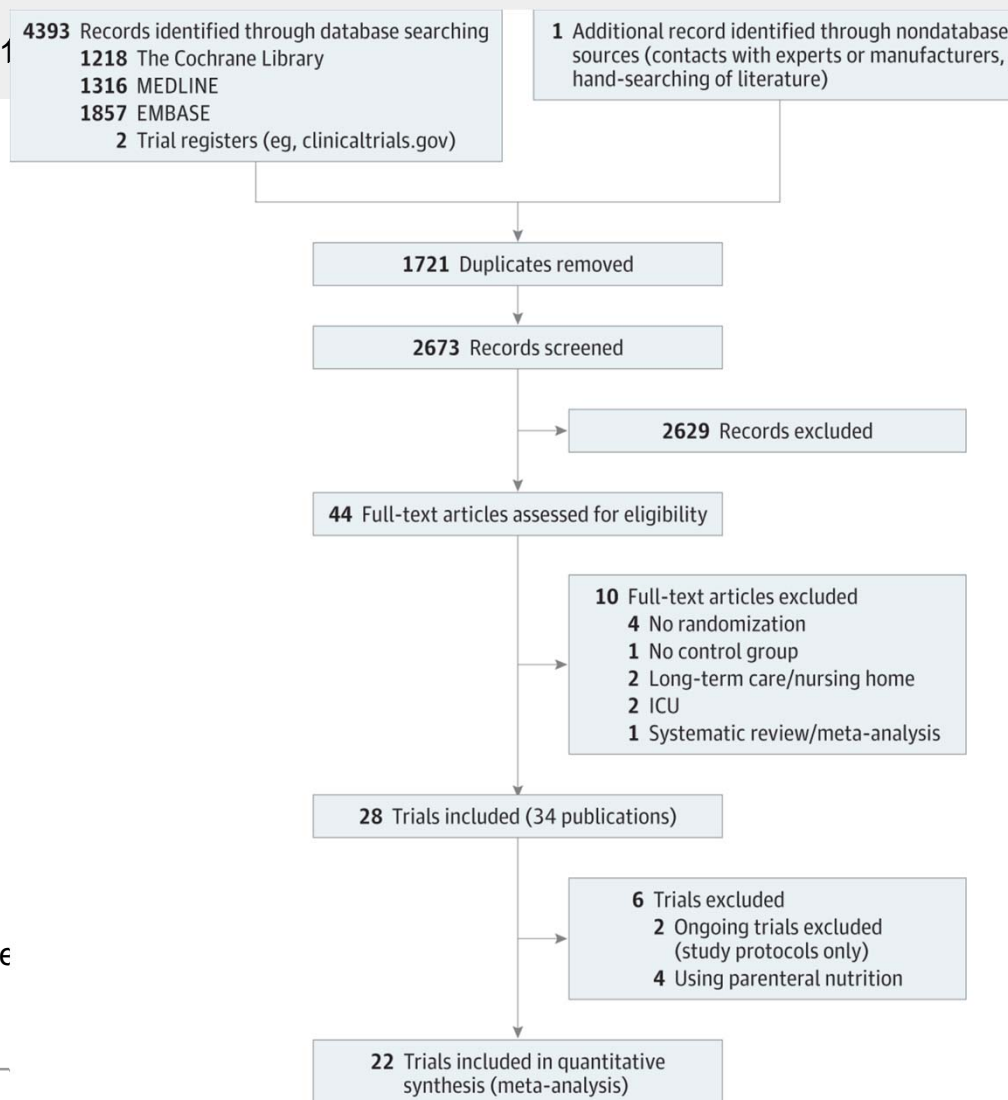
Outcomes:

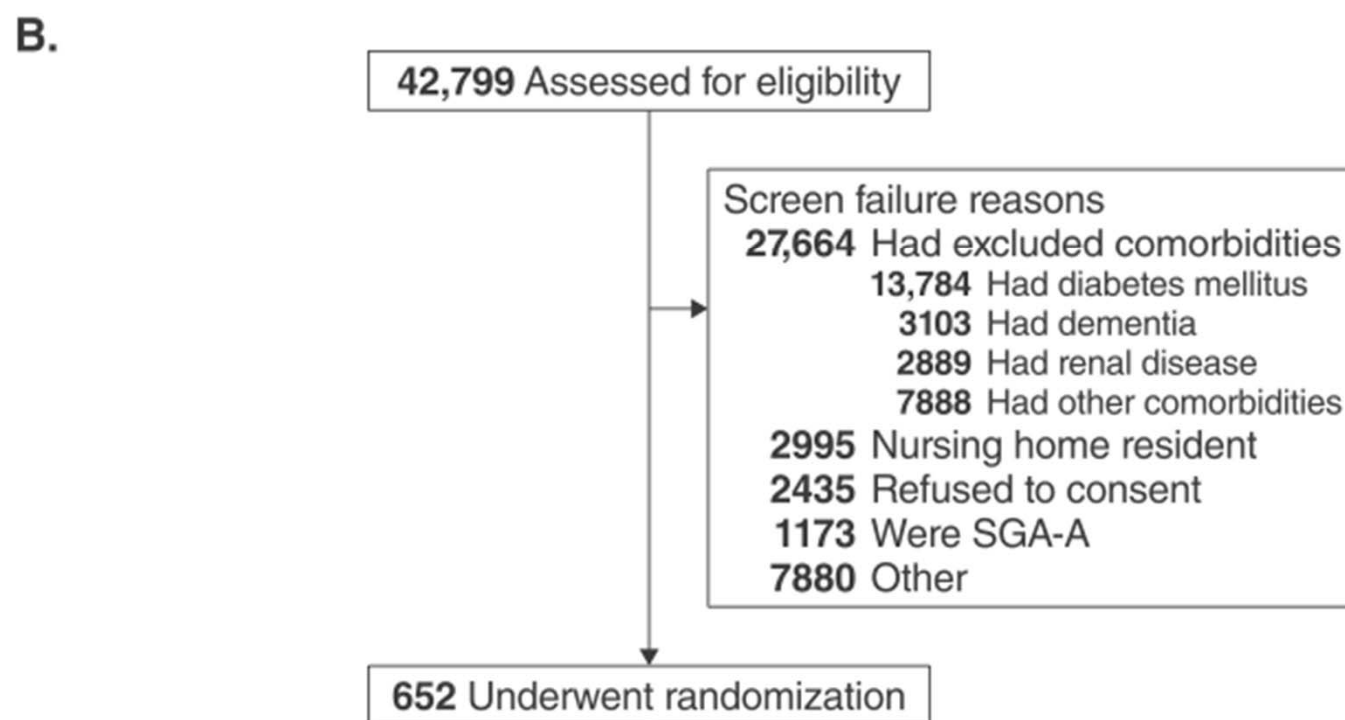
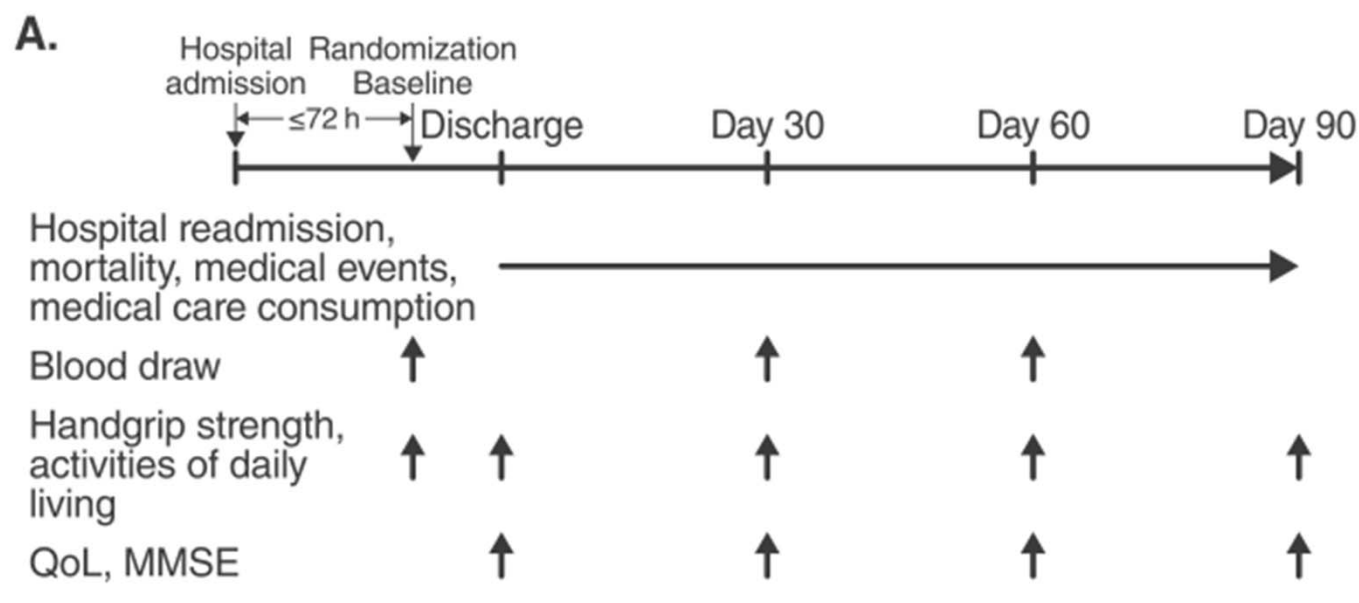
No impact on mortality
No impact on admission
Reduce readmission
Increased weight

?is this really no effect?

Figure Legend:

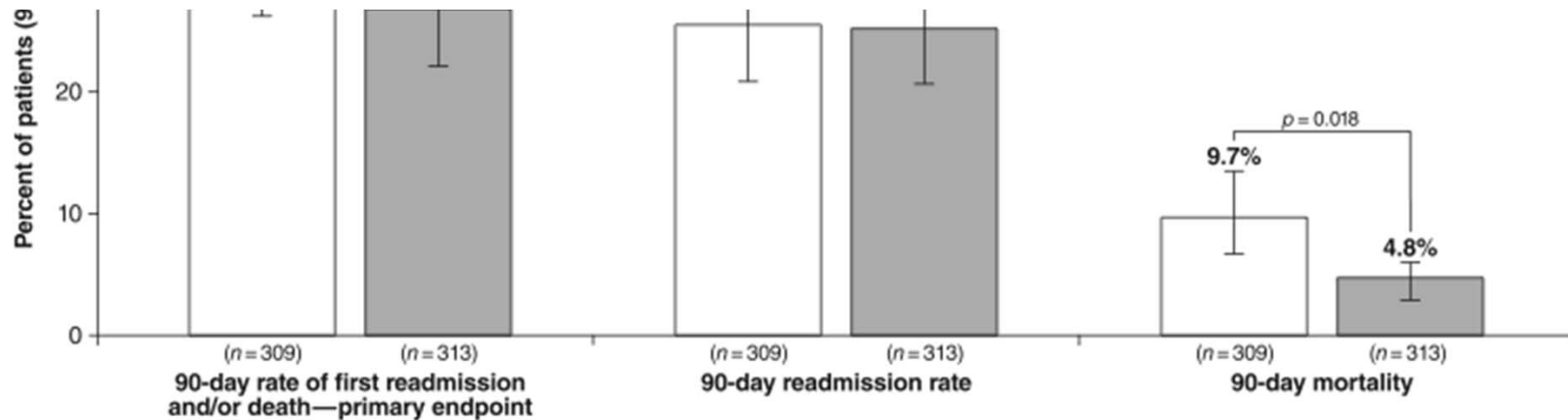
Study Flow Diagram ICU indicates intensive



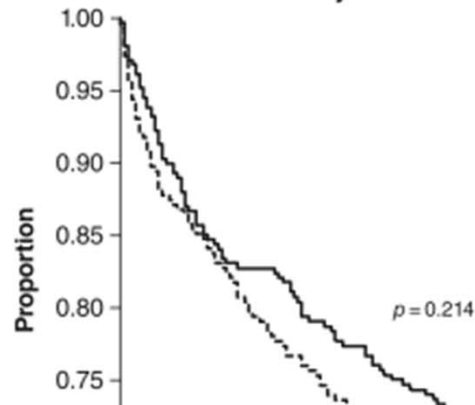


Readmission and mortality in malnourished, older, hospitalized adults treated with a specialized oral nutritional supplement: A randomized clinical trial

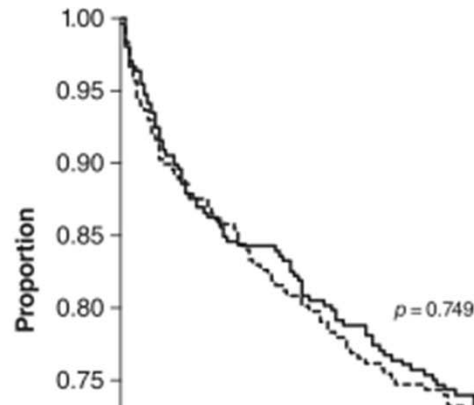
Nicolaas E. Deutz a, *, Eric M. Matheson b, Laura E. Matarese c, Menghua Luo d, Geraldine E. Baggs d, Jeffrey L. Nelson d, Refaat A. Hegazi d, Kelly A. Tappenden e, Thomas R. Ziegler f, on behalf of the NOURISH Study Group



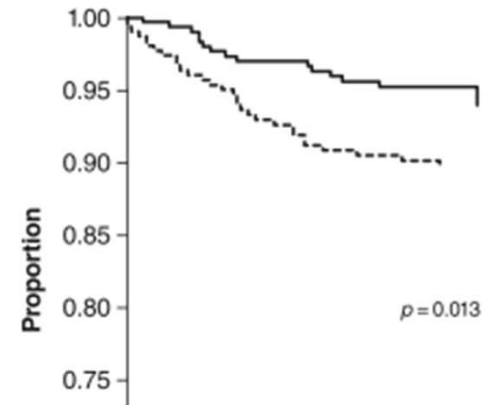
B. Kaplan-Meier Survival Curve: Composite Endpoint of 90-Day Readmission and Mortality



C. Kaplan-Meier Survival Curve: Readmission



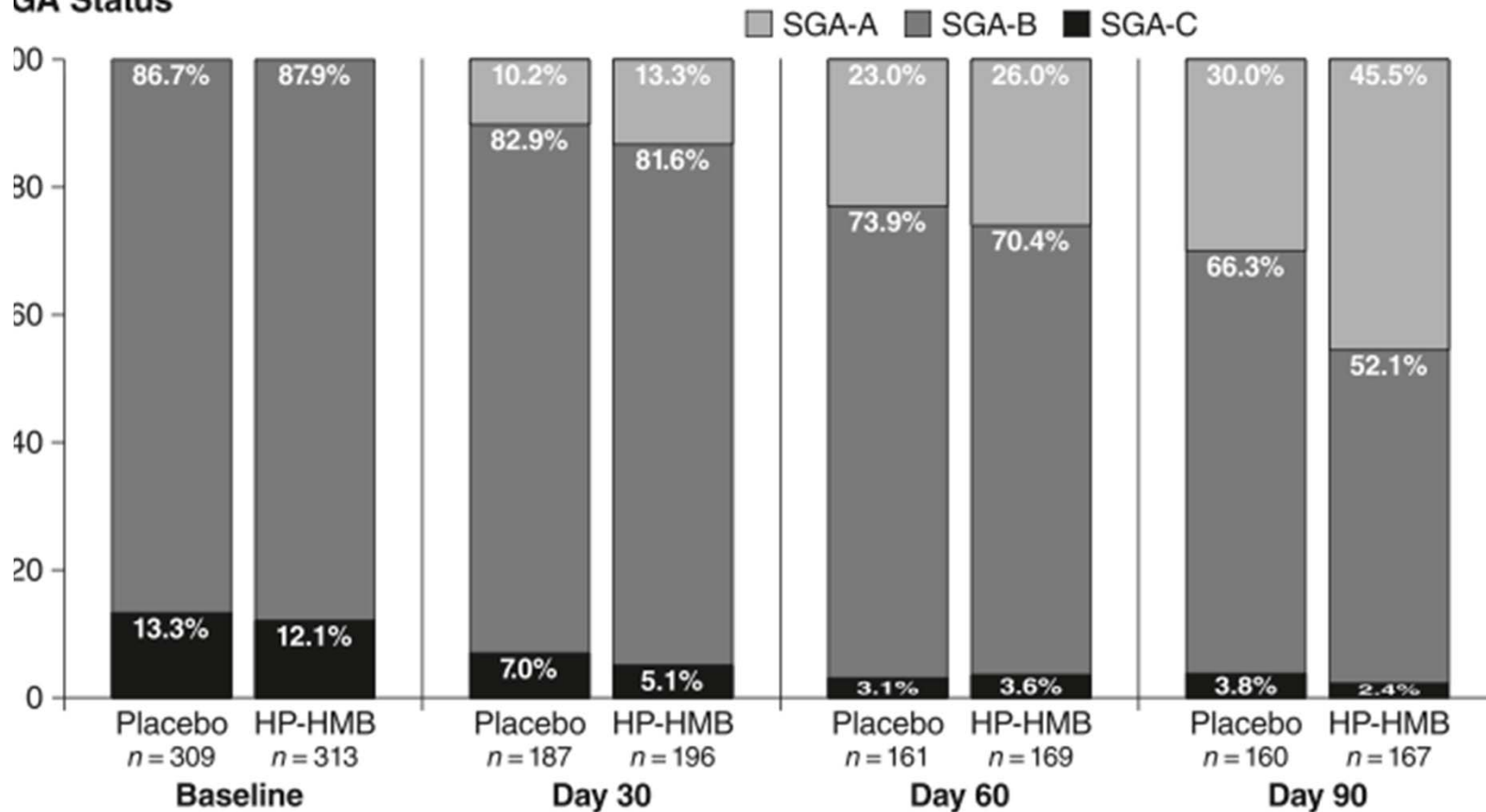
D. Kaplan-Meier Survival Curve: Mortality



NOURISH

Deutz et al Clinical Nutrition 2015

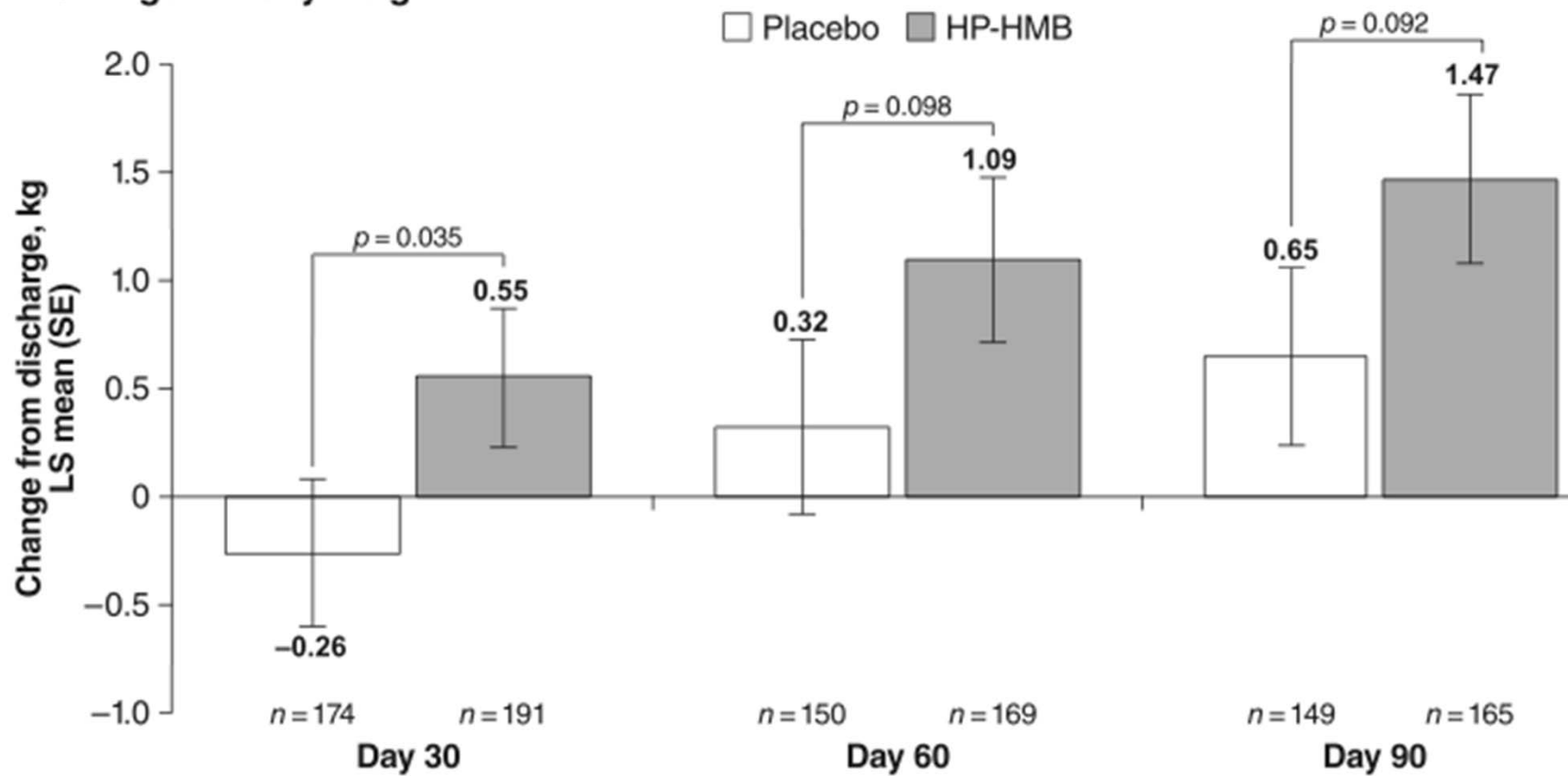
GA Status



NOURISH

Deutz et al Clinical Nutrition 2015

B. Change in Body Weight



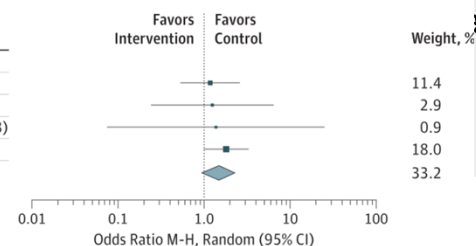
Nutrition Intervention vs Control: Mortality

From: **Nutritional Support analysis**

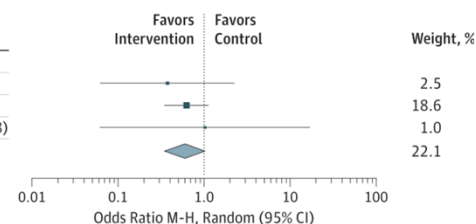
JAMA Intern Med. 2016;176(1

Review and Meta-

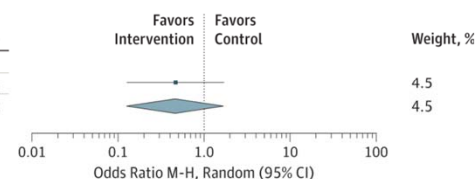
Study or Subgroup	Nutritional Intervention		Control		Odds Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding alone vs placebo					
Vlaming et al, ⁴² 2001	14	274	12	275	1.18 (0.54-2.60)
Hogarth et al, ²⁷ 1996	5	9	8	16	1.25 (0.24-6.44)
Broqvist et al, ²¹ 1994	1	9	1	12	1.38 (0.07-25.43)
Gariballa et al, ²⁴ 2006	32	222	19	223	1.81 (0.99-3.30)
Subtotal (95% CI)	52	514	40	526	1.52 (0.96-2.39)
Heterogeneity: $\tau^2=0.00$; $\chi^2_3=0.77$ ($P=.86$); $I^2=0\%$					
Test for overall effect: $z=1.80$ ($P=.07$)					



Study or Subgroup	Nutritional Intervention		Control		Odds Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding alone vs usual care					
Bunout et al, ²² 1989	2	17	5	19	0.37 (0.06-2.25)
Potter et al, ³⁴ 2001	21	186	33	195	0.62 (0.35-1.13)
Munk et al, ³¹ 2014	1	40	1	41	1.03 (0.06-16.98)
Subtotal (95% CI)	24	243	39	255	0.61 (0.35-1.05)
Heterogeneity: $\tau^2=0.00$; $\chi^2_2=0.43$ ($P=.81$); $I^2=0\%$					
Test for overall effect: $z=1.79$ ($P=.07$)					



Study or Subgroup	Nutritional Intervention		Control		Odds Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding alone vs no support					
Volkert et al, ⁴³ 1996	4	35	8	37	0.47 (0.13-1.72)
Subtotal (95% CI)	4	35	8	37	0.47 (0.13-1.72)
Heterogeneity: not applicable					
Test for overall effect: $z = 1.14$ ($P = .25$)					



Study or Subgroup	Nutritional Intervention		Control		Odds Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding with dietary advice vs usual care					
Starke et al, ⁴⁰ 2011	2	66	5	66	0.38 (0.07-2.04)
Neelemaat et al, ³² 2012	11	105	14	105	0.76 (0.33-1.76)
Saudny-Unterberger et al, ³⁸ 1997	1	17	1	16	0.94 (0.05-16.37)
Holyday et al, ²⁸ 2012	4	71	1	72	4.24 (0.46-38.90)
Rüfenacht et al, ³⁶ 2010	4	18	1	18	4.86 (0.49-48.57)
Subtotal (95% CI)	22	277	22	277	1.05 (0.44-2.46)
Heterogeneity: $\tau^2=0.22$; $\chi^2_4=5.12$ ($P=.28$); $I^2=22\%$					
Test for overall effect: $z=0.10$ ($P=.92$)					

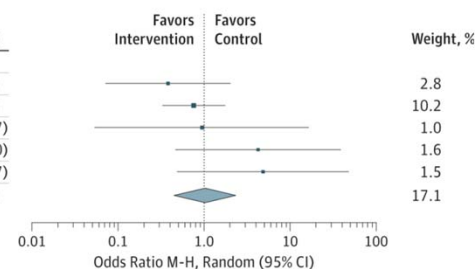
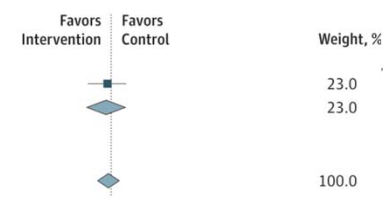


Figure Legend:

Forest Plot Comparing Nutritio

Study or Subgroup	Nutritional Intervention		Control		Odds Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding with dietary advice vs no support					
Hickson et al, ²⁶ 2004	31	292	35	300	0.90 (0.54-1.50)
Subtotal (95% CI)	31	292	35	300	0.90 (0.54-1.50)
Heterogeneity: not applicable					
Test for overall effect: z=0.41 (P = .68)					
Total (95% CI)	133	1361	144	1395	0.96 (0.72-1.27)

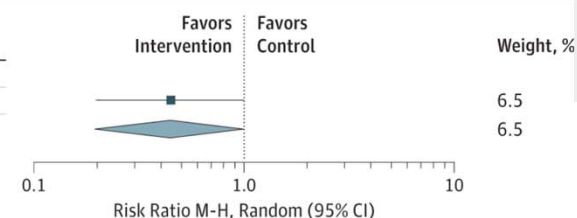


Date of download: 2/17/2016

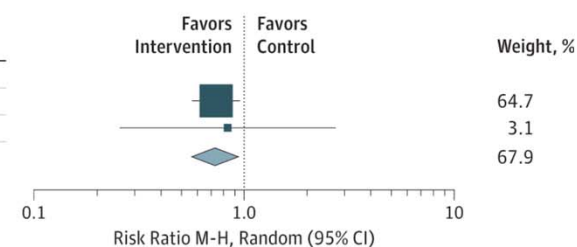
From: **Nutritional Support and Outcomes in Malnourished Medical Inpatients: A Systematic Review and Meta-analysis**

JAMA Intern Med. 2016;176(1)

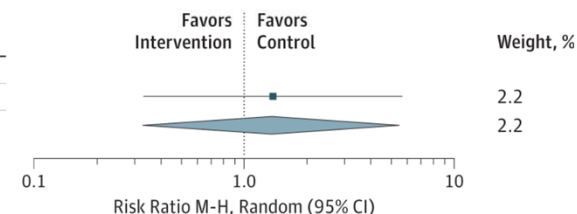
Study or Subgroup	Experimental		Control		Risk Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Enteral nutrition with dietary advice vs usual care					
Somanchi et al, ³⁹ 2011 ^a	8	106	14	83	0.45 (0.20-1.02)
Subtotal (95% CI)	8	106	14	83	0.45 (0.20-1.02)
Heterogeneity: not applicable					
Test for overall effect: z = 1.92 (P = .05)					



Study or Subgroup	Experimental		Control		Risk Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding alone vs placebo					
Gariballa et al, ²⁴ 2006	65	222	89	223	0.73 (0.57-0.95)
Vermeeren et al, ⁴¹ 2004	4	23	5	24	0.83 (0.26-2.73)
Subtotal (95% CI)	69	245	94	247	0.74 (0.57-0.95)
Heterogeneity: $\tau^2 = 0.00$; $\chi^2_1 = 0.04$ ($P = .83$); $I^2 = 0\%$					
Test for overall effect: $z = 2.34$ ($P = .02$)					



Study or Subgroup	Experimental		Control		Risk Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding alone vs no support					
Gazzotti et al, ²⁵ 2003	4	34	3	35	1.37 (0.33-5.68)
Subtotal (95% CI)	4	34	3	35	1.37 (0.33-5.68)
Heterogeneity: not applicable					
Test for overall effect: z = 0.44 (P = .66)					



Study or Subgroup	Experimental		Control		Risk Ratio M-H, Random (95% CI)
	Events	Total	Events	Total	
Oral feeding with dietary advice vs usual care					
Holyday et al, ²⁸ 2012 ^b	8	67	8	71	1.06 (0.42-2.66)
Starke et al, ⁴⁰ 2011	17	64	28	61	0.58 (0.35-0.94)
Subtotal (95% CI)	25	131	36	132	0.69 (0.40-1.18)
Heterogeneity: $\tau^2 = 0.04$; $\chi^2_1 = 1.31$ ($P = .25$); $I^2 = 24\%$					
Test for overall effect: $z = 1.36$ ($P = .17$)					
Total (95% CI)	106	516	147	497	0.71 (0.57-0.87)
Heterogeneity: $\tau^2 = 0.00$; $\chi^2_5 = 3.57$ ($P = .61$); $I^2 = 0\%$					
Test for overall effect: $z = 3.26$ ($P = .001$)					
Test for subgroup difference: $\chi^2_3 = 2.14$ ($P = .54$); $I^2 = 0\%$					

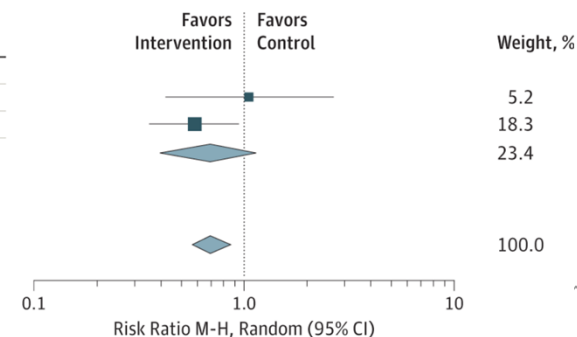


Figure Legend:

Forest Plot Comparing Nutrition

^aCalculated and approximated f

^bCalculated and approximated f

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From: Nutritional Support and Outcomes in Malnourished Medical Inpatients: A Systematic Review and Meta-analysis

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Table 2. Outcomes Overall and in Subgroups

Variable	Odds Ratio (95% CI)		Risk Ratio (95% CI)	Mean Difference (95% CI)				
	Mortality	Hospital-Acquired Infections	Nonelective Readmissions	Functional Outcome, Barthel Index Points	Length of Hospital Stay, d	Daily Caloric Intake, kcal	Daily Protein Intake, g	Weight Change, kg
Overall Population								
Intervention group, events/total (%)	133/1361 (9.8)	48/802 (6.0)	10/516 (20.5)	16.7	10.8	1662	54	0.83
Control group, events/total (%)	144/1395 (10.3)	63/812 (7.8)	14/497 (29.6)	16.7	13.0	1314	46	0.19
Overall estimate	0.96 (0.72 to 1.27)	0.75 (0.50 to 1.11)	0.71 (0.57 to 0.87)	0.33 (−0.88 to 1.55)	−0.42 (−1.09 to 0.24)	397 (279 to 515)	20.0 (12.5 to 27.1)	0.72 (0.23 to 1.21)
I ² Test for overall effect, %	49	0	0	85	0	89	91	92
Stratification by Malnutrition								
Established malnutrition	0.70 (0.43 to 1.13)	NA	0.45 (0.20 to 1.02)	4.00 (1.69 to 6.31)	−2.08 (−4.19 to 0.02)	354 (259 to 448)	18.9 (9.7 to 28.2)	1.22 (0.06 to 2.38)
Risk for malnutrition	1.14 (0.83 to 1.57)	0.75 (0.50 to 1.11)	0.73 (0.59 to 0.90)	−0.26 (−0.72 to 0.20)	−0.24 (−0.94 to 0.46)	434 (245 to 624)	17.8 (3.7 to 31.9)	0.80 (0.45 to 1.16)
I ² Test for subgroup difference, %	64	NA	21	92	49	0	0	0
Stratification by Mortality Risk in Control Group								
High mortality risk, ≥10%	0.77 (0.59 to 1.02)	0.77 (0.17 to 3.46)	NA	0.85 (−1.47 to 3.16)	−0.89 (−2.50 to 0.72)	231 (81 to 380)	16.0 (2.9 to 29.9)	0.41 (−0.42 to 1.24)
Low mortality risk, <10%	1.45 (0.99 to 2.13)	0.75 (0.50 to 1.13)	0.73 (0.59 to 0.90)	−0.30 (−0.86 to 0.26)	−0.15 (−0.91 to 0.61)	455 (321 to 587)	18.9 (11.5 to 26.4)	0.83 (0.47 to 1.19)
I ² Test for subgroup difference, %	86	0	NA	0	0	79	0	0
Stratification by Adherence to Nutrition Protocol								
High adherence	1.17 (0.69 to 1.99)	0.71 (0.41 to 1.24)	0.66 (0.43 to 1.01)	NA	−0.09 (−0.99 to 0.88)	430 (324 to 537)	20.0 (13.5 to 26.6)	0.90 (0.55 to 1.25)
Low adherence	0.78 (0.53 to 1.13)	0.79 (0.45 to 1.38)	0.72 (0.57 to 0.92)	0.33 (−0.88 to 1.55)	−0.82 (−1.80 to 0.16)	107 (24 to 191)	8.3 (−3.2 to 19.8)	0.17 (−0.51 to 0.84)
I ² Test for subgroup difference, %	35	35	0	NA	0	95	67	72
Stratification by Route of Nutritional Therapy								
Oral feeding, noninterventional	0.97 (0.68 to 1.38)	0.75 (0.50 to 1.11)	0.73 (0.59 to 0.90)	0.33 (−0.88 to 1.55)	−0.29 (−0.97 to 0.40)	383 (261 to 505)	17.8 (10.9 to 24.8)	0.72 (0.23 to 1.21)
Enteral feeding	NA	NA	0.45 (0.2 to 1.02)	NA	−2.60 (−5.32 to 0.12)	613 (318 to 908)	48.6 (36.2 to 61.0)	NA
I ² Test for subgroup difference, %	NA	NA	21	NA	52	50	94	NA

Abbreviation: NA, not applicable.

Table Title:

Outcomes Overall and in Subgroups

Date of download: 2/1/2018

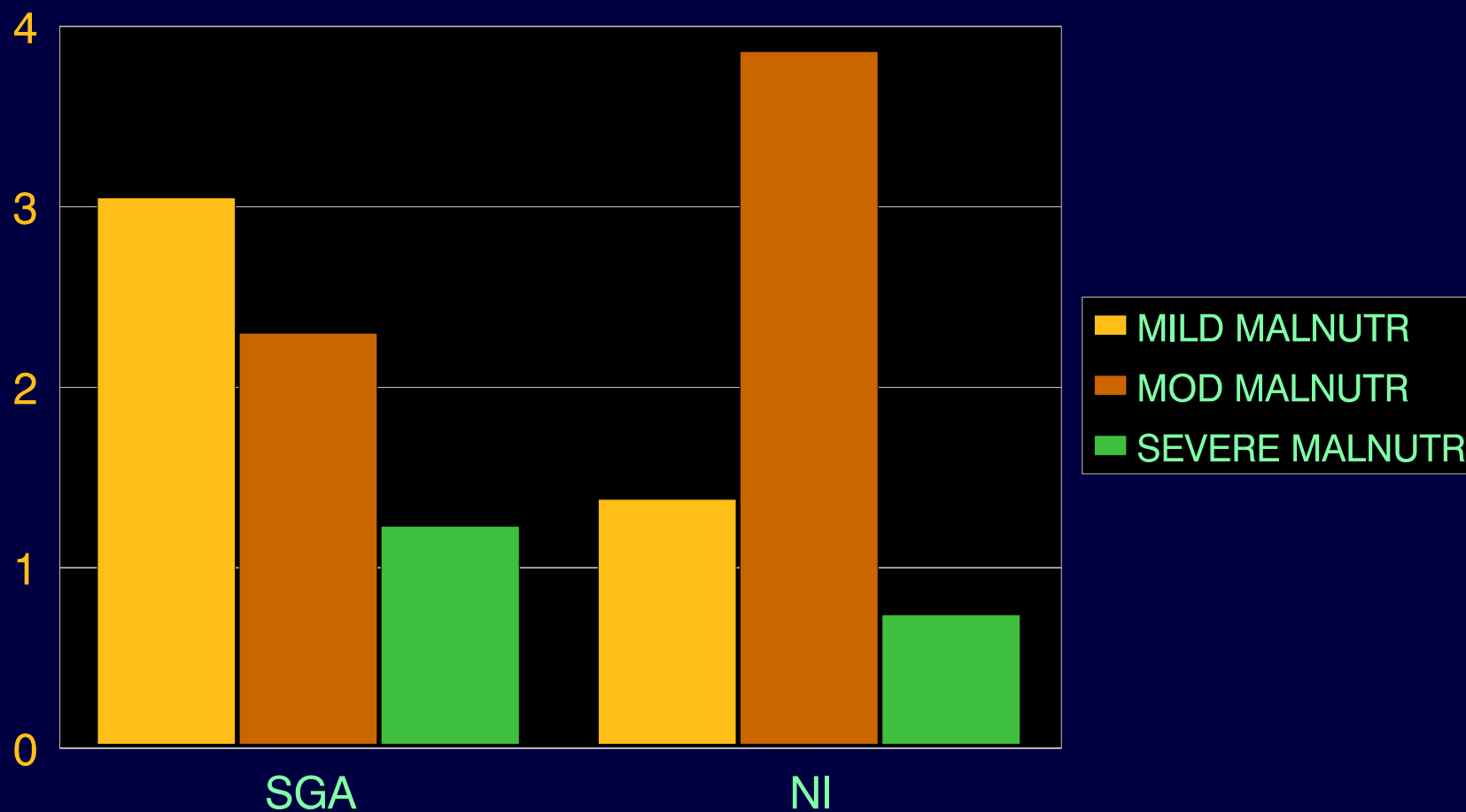
Perioperative Parenteral Nutrition

- 429 patients enrolled
- All operative patients eligible
- Nutrition index or SGA used to classify malnutrition
- Randomized to control or TPN
- Energy = RMR + 1000 kcal
- Protein = 150 kcal/g N

Buzby et al. 1991

PERIOPERATIVE NUTRITIONAL SUPPORT

INFECTIOUS COMPLICATIONS RATIO OF TPN/CONT



BUZBY ET AL (1991)

Conclusions

- Nutrition care is everyone's responsibility
- The greater the nutrition risk, the greater the role of the gastroenterologist in defining and supporting nutrition care
- Nutrition care must span the continuum from hospital to home
- Do not delay nutrition care in those at high risk for the sake of diagnosis and or treatment
- Nutrition care presents an opportunity to engage patients in their own care