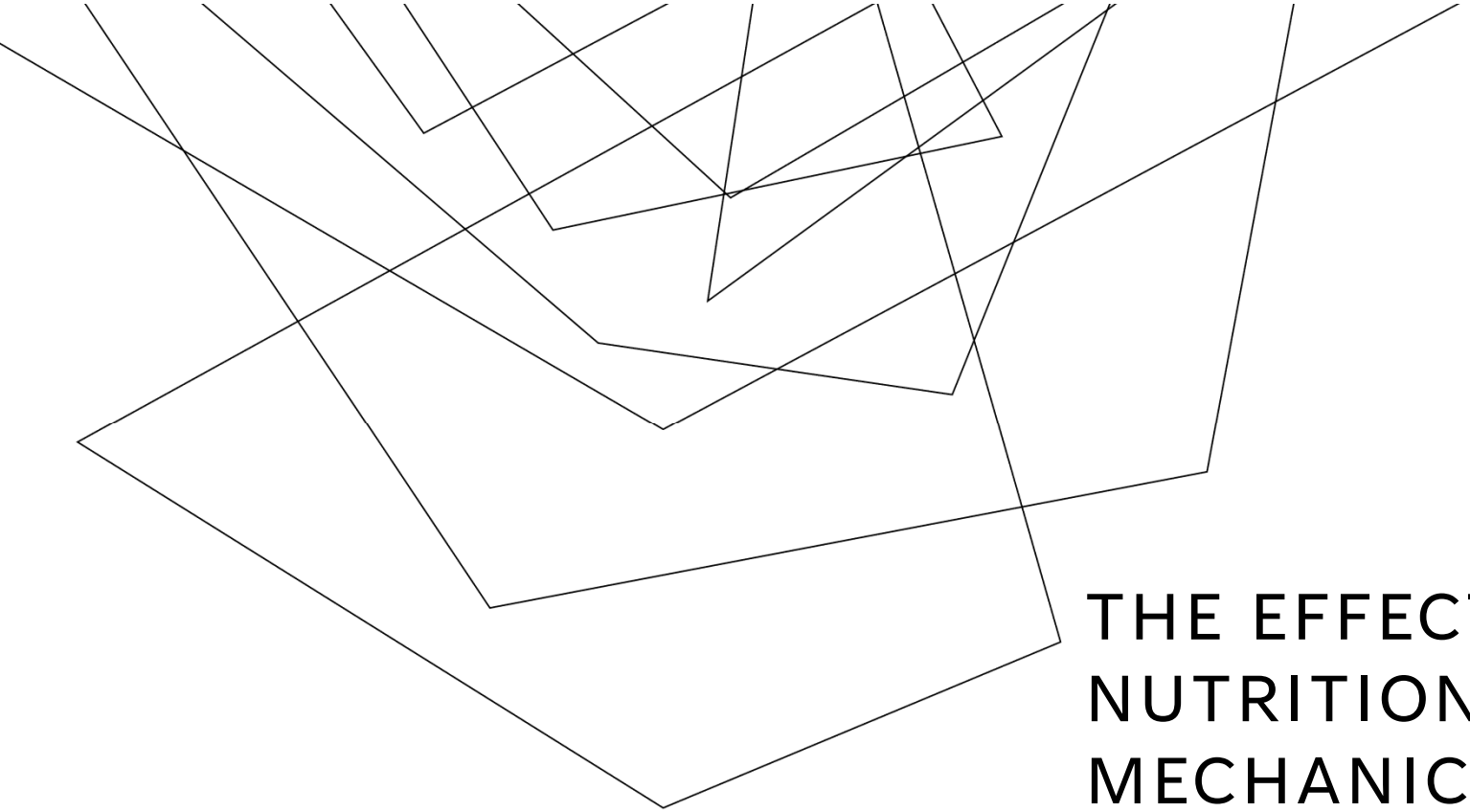

THE EFFECTS OF NUTRITION ON MECHANICAL VENTILATION

RENA LALIBERTE BS, RRT, CPFT, FAARC
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HENRY FORD HEALTH- DETROIT, MICHIGAN

DISCLOSURES

Honorarium paid by Respiratory Associates online education

AARC safe and effective staffing guide committee

AARC Clinical Practice Guideline updates committee

Clinical Education and Tracheostomy Collaboratives

AARC Clinical Education Taskforce Co-Chair

Global Tracheostomy Collaborative (Committee Member)

Michigan Society for Respiratory Care District 10 representative, Conference and HOSA committee member

Advisory Board Member for Oakland Community College, Saint Clair Community College, Henry Ford Community College, Jackson Community college, and University of Kansas School of Health Science (Respiratory Care)

OBJECTIVES

Review literature related to nutritional support in the Intensive Care Unit

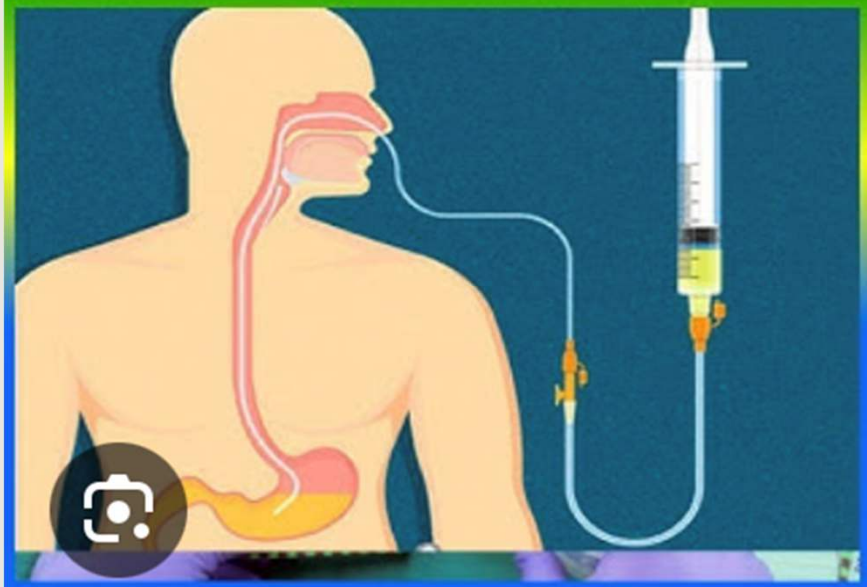
Define Resting Energy Expenditure and Respiratory Quotient

Examine the effects of inadequate nutrition on mechanical ventilation

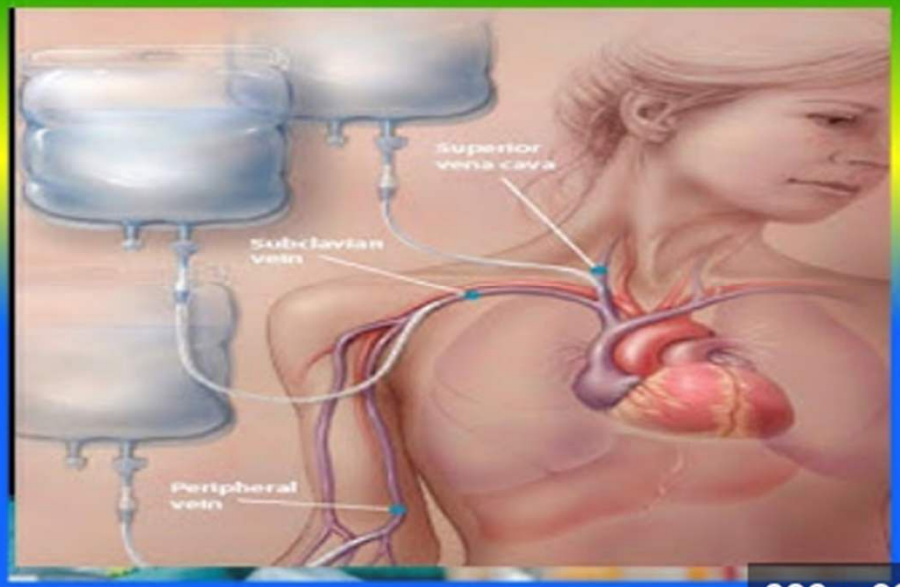
Identify the key considerations for mechanically ventilated patients with failure to wean

Difference Between

Enteral Nutrition



Parenteral Nutrition



686 × 386

IMPROVED MORTALITY AFTER PROLONGED MECHANICAL VENTILATION

The Association Between Nutritional Adequacy and Long-Term Outcomes in Critically Ill Patients Requiring Prolonged Mechanical Ventilation

A Multicenter Cohort Study*

Wei, Xuejiao MSc[1]; Day, Andrew G. MSc[1,2]; Ouellette-Kuntz, Hélène PhD[1]; Heyland, Daren K. MD, MSc[2,3]

Author Information

Critical Care Medicine 43(8):p 1569-1579, August 2015. | ***DOI:*** 10.1097/CCM.0000000000001000

The Association Between Nutritional Adequacy and Long-Term Outcomes in Critically Ill Patients Requiring Prolonged Mechanical Ventilation

A Multicenter Cohort Study*

Wei, Xuejiao MSc[1]; Day, Andrew G. MSc[1,2]; Ouellette-Kuntz, Hélène PhD[1]; Heyland, Daren K. MD, MSc[2,3]

- This was a retrospective analysis on data prospectively collected in the context of a randomized controlled trial (RCT) of glutamine and antioxidants supplementation in critically ill patients
- Mechanically ventilated adult patients 18 years old and older admitted to ICU who had two or more organ failures related to their acute illness were eligible for the RCT.
- The daily total caloric intake from enteral nutrition (EN), parenteral nutrition (PN), and propofol infusions was collected from ICU admission for a maximum of 28 days, unless ICU discharge or death occurred sooner.
- Study patients were followed for a maximum of 6 months from the date of ICU admission.
- This study has suggested an important relationship between receiving adequate caloric intake as early as the first week of ICU stay and longer survival time as well as faster physical recovery to 3 months but not 6 months post ICU discharge in critically ill patients with prolonged mechanical

NUTRITION'S EFFECT ON WEANING

Article | Open access | Published: 14 July 2022

Nutritional support for successful weaning in patients undergoing prolonged mechanical ventilation

Shih-Ching Lo, Kevin Sheng-Kai Ma, Yen-Ru Li, Zi-Yue Li, Cheng-Hung Lin, Hsing-Chun Lin & Shun-Fa Yang

Scientific Reports **12**, Article number: 12044 (2022) | Cite this article

STUDY RESULTS – NUTRITIONAL SUPPORT

- Underfeeding and overfeeding may increase the risk of infection of ventilated patients and prolong ventilator weaning time. Therefore, nutrition intervention plays a key role in critical care.

- In this study we found that more near the target caloric intake, and protein delivery above 1.2 g/kg/day can improve nutrition for successful ventilator weaning. Optimizing nutrition for critically ill patients can improve their clinical outcomes. Reducing caloric and protein deficits is associated with successful ventilator weaning and significantly lower mortality

- Of clinical relevance is that enteral feeding intolerance in mechanically ventilated critically ill patients is associated with malnutrition, fewer ventilator-free days (VFDs), longer LOS, and increased mortality

- The survival rate of the successful extubation group was significantly higher than that of the failed weaning group. The successful extubation group had a mortality rate of 12.1% and the failed weaning group had a mortality rate of 25.7%. Furthermore, RCC LOS and hospital LOS were reduced. In the successful extubation group, medical costs were reduced by $5,475 per person on average when compared with the failed weaning group

RESTING ENERGY EXPENDITURE AND NUTRITION

Defined: REE represents the number of calories used to sustain basic life processes including respiration, heartbeat, kidney function, and blood circulation. REE is a measurement of your metabolism rate and. represents the minimum number of calories needed for vital physiological functions.

ASSESSMENT OF RESTING ENERGY EXPENDITURE IN MECHANICALLY VENTILATED PATIENTS

AUTHORS ;FAISY CHRISTOPHE, GUEROT EMMANUEL, DIEHL JEANLUC, LABROUSSE JACQUES, FAGON JEAN-YVES

THE AMERICAN JOURNAL OF CLINICAL NUTRITION
VOLUME 78, ISSUE 2, AUGUST 2003, PAGES 241-249

- **Metabolism is acutely modified by any form of severe disease. Resting energy expenditure (REE) is also influenced by malnutrition. Results of one study showed that malnutrition affected 40–50% of the patients in the intensive care unit (ICU)**
- **Malnutrition is linked to higher morbidity and mortality rates and increased length of stay. Thus, caloric requirements and specific metabolism are essential components of the care of these patients.**
- **Indirect calorimetry is a noninvasive technique that assesses the heat liberated during metabolic oxidative processes by measuring oxygen consumption ($\dot{V}O_2$) and carbon dioxide production ($\dot{V}CO_2$).**

MANUAL CALCULATION OF REE

Harris–Benedict Equation

$$\mathrm{REE(men)} = 66.45 + 13.75 \times \text{body weight} + 5 \times \text{height} - 6.76 \times \text{age}$$

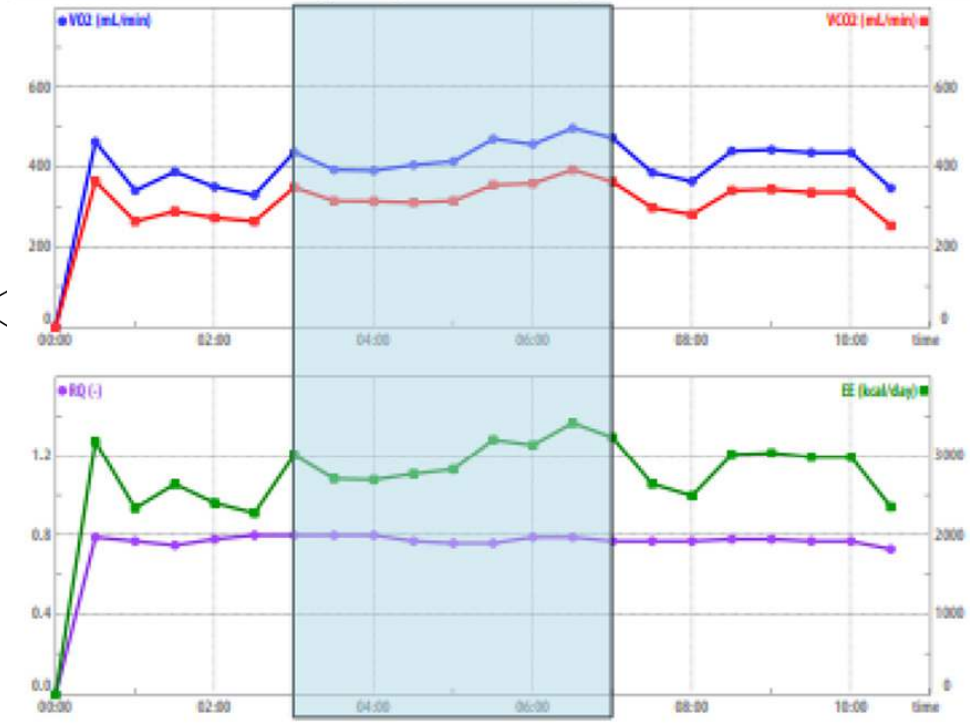
$$\mathrm{REE(women)} = 655.1 + 6.56 \times \text{body weight} + 1.85 \times \text{height} - 4.65 \times \text{age}$$

METABOLIC MONITORING IN THE ICU

INDIRECT CALORIMETRY WITH THE USE OF A METABOLIC MONITOR – WHEN NOT TO USE

1. **Hemodynamic and Respiratory instability**
2. **Variations in carbon dioxide pool (bicarb infusion, digestive or renal loss of bicarb, extracorporeal blood lines ex. Dialysis)**
3. **IV Feeding (should be held at least 6 hours before calorimetry)**
4. **Air leaks – chest tubes or specialty gases**
5. **High FI02 or PEEP >10cmH20**
6. **Accumulation of intermediate metabolites (energy produced by ketogenesis or alcohol intoxication**

Indirect Calorimetry Report - Canopy Test



Operator Notes

REE	[illegible]		RQ 0.78
137 %pred	kcal/day		np [illegible] --
			Vp 53.1 L/min
VO2 438 mL/min	VCO2 343 mL/min		FeCO2 0.88 %
Substrates			
FAT 74 (%)	CHO 26 (%)	PRO 0 (%)	FeO2 19.92 %
Variability			
VO2 8 %	VCO2 8 %		AVG Interval 04:00 min
			Duration 00:10:30 min

RESPIRATORY QUOTIENT IN NUTRITION

Respiratory quotient (RQ) is defined as the ratio between carbon dioxide production and oxygen consumption, typically represented as RQ = CO2 produced / O2 consumed. For example, an RQ of 0.8 indicates that carbon dioxide production is slightly less than oxygen consumption.

The respiratory quotient is measured using a respirometer and provides valuable information about a person's nutritional status. RQ values typically range from 0.7 to 1.2, with higher values suggesting carbohydrate metabolism and lower values potentially indicating insufficient energy intake.

For oxidation of a fatty acid molecule, namely palmitic acid: A RQ near 0.7 indicates that fat is the predominant fuel source, a value of 1.0 is indicative of carbohydrate being the predominant fuel source, and a value between 0.7 and 1.0 suggests a mix of both fat and carbohydrate.

DISCUSSION

Report confirms the increase in carbon dioxide production noted when large carb loads in TPN are given.

C02 production is increased in this population because calories in excess of energy needs result in lipogenesis and a markedly increased RQ.

RQ of glucose is 1.0

RQ of lipogenesis is approx. 8.0 reflecting the much greater production of C02 relative to oxygen consumed.

In these cases, compromised pulmonary and muscle status these patients could not handle the increased C02 load

Clinicians should recognize that patient receiving parenteral nutritional solutions with failure to wean with hypercapnia, failure may be related to nutrition.

HYPERCAPNIA DURING WEANING-A COMPLICATION OF NUTRITIONAL SUPPORT

DARK, MD ET AL, CHEST, JULY 1965

Case reports and discussion KU, Kansas City
Patient 1

21y/o m. 3-month ICU vent course for ARDS

ABG 90,38,7.43 – Resting MV 22.0L

Post ABG after T-Tube wean 53, 7.27 (hypercapnia)with acute distress

5,400Kcal (4,284 carbohydrate Kcal TPN)to correct severely depleted nutritional state

C02 production was measured at 500ml/min

Carb calories reduced to 2,550 and 2.040Kcal/day

C02 production decreased to 390 and 356ml/min.

Patient remained stable after changes and was successfully weaned

Patient 2

26y/o f. six weeks in ICU with ARDS from cytomegalovirus

Preweaning ABG 63,42,7.43 - Resting MV 16.3

On T Tube for weaning, she developed distress – 52, 7.36

Receiving 3,200Kcal/day (2,550 CHO Kcal/day TPN)

CHO calories were decreased and C02 production decreased from 52mmHg to 42mmHg as CHO calories were decreased from 2,550 to 1,530/day

Patient stabilized and was successfully weaned within days

EFFECT OF NUTRITIONAL SUPPORT ON WEANING PATIENTS OFF MECHANICAL VENTILATION

BASSILI, ET ALL, JOURNAL OF PARENTERAL AND ENTERAL NUTRITION 1981 (ST. JOSEPH'S TORONTO, ONT. CANADA

Retrospective Chart Review 219 patients from July 1977-June 1979

Two Groups A and B

Group A received a protein –free, routine isotonic IV diet providing 1650kJ/day (400 kcal) in the form of dextrose in water or electrolyte solution. (kJ=kilojoules)

Group B received nutritional support in the form of total parenteral nutrition (TPN) or alimentary tube feeding 8300-12,600 kJ/day (2000-3000 kcal) with provision of optimum nitrogen

THE RESULTS

TABLE I
Outcome of mechanical ventilation

	Male	Female	Total	Weaned off successfully
Group A				
Medical	6	5	11	10 (90.9%)
Surgical	17	5	22	8 (36.3%)
Total	23	10	33	18 (54.5%)
Group B				
Medical	2	1	3	3 (100%)
Surgical	6	5	11	10 (90.9%)
Total	8	6	14	13 (92.8%)

DISCUSSION

- The effect of protein-free energy deficient diet has multiple sequelae.
    - Passive ventilation causes respiratory muscle atrophy and are cannibalized for energy needs
    - Albumin levels fall
    - Low serum albumin, possibly low surfactant production, devitalization of respiratory membrane, immunocompetence could contribute to pulmonary transudation, pulmonary collapse, low compliance, and pulmonary infection. These sequelae of a protein-free, energy deficient diet would prevent discontinuation of mechanical ventilation.

DISCUSSION CONTINUED.

In hypermetabolic patients receiving TPN, recent studies using RQ have suggested that large glucose loads increase C02 production and prevent or delay weaning.

However, studies using N balance and body composition indicate that carbohydrate is metabolized more efficiently than lipids. The optimal proportion of lipid used with TPN is a controversial topic.

In this paper, group A 90.9% of medical ventilated patients were able to be weaned compared with only 6.3% of surgical patients.

Surgical patients have a greater metabolic demand and more severe sepsis and yet the nourished group B showed highly significant success.

Although nutritional support is indicated in ALL patients who cannot aliment for a prolonged period. It is particularly important for the weaning process in surgical compared to medical patients. Nutritional maintenance appears to significantly influence the success in weaning and should be provided when prolonged mechanical ventilation is anticipated.

ADEQUACY OF NUTRITION IN MECHANICALLY VENTILATED PATIENTS

O'LEARY-KELLEY RN, PHD, CCRN E. AL. AJCC (2005) 14 (3)
WEI, MSC, KEYLAND, MD ET. AL CCM. 2015

One study prospective descriptive design – 60 patient receiving enteral feeds at target or goal. (all mechanically ventilated)

Second study Retrospective analysis of data multicenter RCT 1,223 patients (all mechanically ventilated patients – nutritional adequacy during the first 8 days – survival status, QOL obtained at 3- and 6-months post ICU admission.

KEY TAKE AWAYS FROM THE RESEARCH

Study Number One

Mean energy requirements and intake differed significantly

41 patients received less than 90% of their required energy intake

Diarrhea, emesis, large residual volumes, feeding tube replacements and interruptions for procedures accounted for 70% of the variance

Procedural interruptions alone accounted for 45% of total variance

Study Number Two

This study suggests that there is an important relationship between adequate caloric intake as early as the first week of an ICU stay.

Longer survival time as well as faster physical recover at 3 months, but not 6 months post discharge.

Current recommendations advocating underfeeding in the ICU during the first week could be harming long-stay ICU patients receiving mechanical ventilation

EARLY ENTERAL NUTRITION AND OUTCOMES OF CRITICALLY ILL PATIENTS TREATED WITH VASOPRESSORS AND MECHANICAL VENTILATION

KHALID, MD, DOSHI, MD, BRUNO DIGIOVINE, MD AM J CRIT CARE(2010) 19 (3)

Objective: early enteral feeding on outcomes for critically ill medical patients with hemodynamic instability (also mechanically ventilated

Prospective data collection, multi-institutional medical ICUs analyzed retrospectively

1174 patients separated into 2 groups: 707 received enteral nutrition within 48 hours of initiation of Mechanical Ventilation. 467 who did not.

Primary end points ICU and hospital mortality.

Results: ICU stay, and hospital mortality were lower in the early enteral nutrition group than the late enteral group. *The effect of early feeding was more evident in the sickest patients, that is, those treated with multiple vasopressors and those without early improvement.

Conclusion: early enteral nutrition may be associated with reduced intensive care unit and hospital mortality in patients whose hemodynamic condition is unstable.

INFLUENCE OF REDUCED MUSCLE MASS AND QUALITY ON VENTILATOR WEANING AND COMPLICATIONS DURING ICU STAY IN COVID-19 PATIENTS

CRISTEL, ET AL CLINICAL NUTRITION DEC 01, 2022, VOL 41, ISSUE 12

Observational study based on medical record review ALL patients admitted to the ICU of a tertiary hospital in Milan. (intubated with SARS-CoV-2 first wave of pandemic) n=81

Muscle mass and quality measurement retrieved from routing thoracic CT scans. (sections passing through the 1, 2 or 3rd lumbar vertebra)

Covid-19 patients demonstrate enhanced catabolism, which perturbs muscle homeostasis and increased muscle degradation. Therefore, these patients are at risk for acute sarcopenia, which can evolve to chronic sarcopenia.

Recommendation: EARLY identification of typical sarcopenic features at muscle imaging. Early detection of acute muscle wasting during ICU stay, would allow sufficient time to implement corrective interventions such as adequate protein supply and physical therapy.

These actions may ultimately improve the prognosis of the patient.

SARCOPENIA (DEFINED)

Sarcopenia is a progressive, age-related condition defined by the gradual loss of skeletal muscle mass, strength, and function, starting around age 30 and accelerating with age, leading to weakness, balance problems, and difficulty with daily activities like walking or getting up from a chair. This muscle loss increases the risk of falls, fractures, poor quality of life, and loss of independence, affecting overall vitality, metabolism, and increasing the risk for other diseases like diabetes.

Home > Critical Care > Article

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

Research | Open access | Published: 19 September 2013

Volume 17, article number R206, (2013) Cite this article

Cited 464 times

Results:

There were 149 severely injured elderly patients (median age 79 years) enrolled in this study of which 71% were sarcopenic. Of the patients who were sarcopenic, 9% were underweight, 44% normal weight, and 47% overweight/obese as per body mass index (BMI) classifications.

Neither BMI, serum albumin nor total adipose tissue on admission were indicative of survival, ventilator-free or ICU-free days.

Conclusions:

Sarcopenia is highly prevalent in the elderly population with traumatic injuries. Traditional measures of nutritional assessment, such as BMI and serum albumin, do not accurately predict outcome in the injured elderly. Sarcopenia, however, represents a potential new predictor for mortality, discharge disposition, and ICU utilization. Measurement of muscularity allows for the early identification of at-risk patients who may benefit from aggressive and multidisciplinary nutritional and rehabilitative strategies.

KEY POINTS FOR NUTRITION IN THE MECHANICALLY VENTILATED ICU PATIENT.

Carbohydrates considerations

Large carbohydrate load in TPN can cause increase in C02 production in some patients.

Some patients receiving parenteral feeding, and also failing to successfully wean with hypercapnia, consider the possibility that nutrition may be the issue

Surgical patients are at risk for sepsis and failure to wean, N balance and dietary needs should be assessed early in this population.

Interruptions in feeding should be minimized

Protein considerations

Signs of muscle wasting and sarcopenia should be assessed early.

Adequate protein supply in this patient population is essential for decreased LOS, decreased MV days and improved mortality

BMI, Total albumin do not adequately predict outcome

Interruptions in feeding should be minimized

Clinical Nutrition 49 (2025) 202–208

Contents lists available at ScienceDirect

Clinical Nutrition

journal homepage: http://www.elsevier.com/locate/clnu

Original article

Recognizing malnutrition in adults with critical illness: Guidance statements from the Global Leadership Initiative on Malnutrition

R. Fukushima [a, 1, *], C.W. Compher [b, 1], M.I.T.D. Correia [c], M.C. Gonzalez [d], L. McKeever [e], K. Nakamura [f], Z.Y. Lee [g, h], J.J. Patel [i], P. Singer [j], C. Stoppe [k, h], J.C. Ayala [l], R. Barazzoni [m], M.M. Berger [n], T. Cederholm [o], K. Chittawatanarat [p], A. Cotoia [q], J.C. Lopez-Delgado [r], C.P. Earthman [s], G. Elke [t], W. Hartl [u], M.S. Hasan [v], N. Higashibeppu [w], G.L. Jensen [x], K.J. Lambell [y], C.C.H. Lew [z], J.I. Mechanick [aa], M. Mourtzakis [ab], G.C.C. Nogales [ac, ad], T. Oshima [ae], S.J. Peterson [af], T.W. Rice [ag], R. Rosenfeld [ah], P. Sheean [ai], F.M. Silva [aj], P.C. Tah [ak], M. Uyar [al]

› Clin Nutr. 2019 Feb;38(1):1-9. doi: 10.1016/j.clnu.2018.08.002. Epub 2018 Sep 3.

GLIM criteria for the diagnosis of malnutrition - A consensus report from the global clinical nutrition community

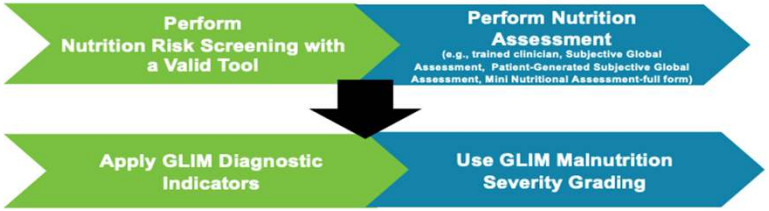
T Cederholm [1], G L Jensen [2], M I T D Correia [3], M C Gonzalez [4], R Fukushima [5], T Higashiguchi [6], G Baptista [7], R Barazzoni [8], R Blaauw [9], A Coats [10], A Crivelli [11], D C Evans [12], L Gramlich [13], V Fuchs-Tarlovsky [14], H Keller [15], L Llido [16], A Malone [17], K M Mogensen [18], J E Morley [19], M Muscaritoli [20], I Nyulasi [21], M Pirlich [22], V Pisprasert [23], M A E de van der Schueren [24], S Siltharm [25], P Singer [26], K Tappenden [27], N Velasco [28], D Waitzberg [29], P Yamwong [30], J Yu [31], A Van Gossum [32], C Compher [33];
GLIM Core Leadership Committee; GLIM Working Group

Global Leadership Initiative on Malnutrition (GLIM): A Framework for Diagnosing Adult Malnutrition

GLIM

- Is a new approach that offers a framework for diagnosing malnutrition in adult patients
- Includes five practicable indicators that can be used in routine clinical practice
- Clinicians are encouraged to complete a comprehensive nutrition assessment to use as a basis for the GLIM diagnosis and/or to triage for interventions.

GLIM ORDER OF OPERATIONS



GLIM CRITERIA

Phenotypic criteria:

- **Unintentional weight loss** by time frame
- **Low body mass index (BMI; kg/m²)** according to age and ethnicity
- **Reduced muscle mass** based on valid body composition assessment methods
  - Examples: physical exam, dual-energy absorptiometry, bioelectrical impedance analysis, ultrasound, computed tomography, magnetic resonance imaging, mid upper arm circumference, or calf circumference

Etiologic criteria:

- **Reduced food intake or assimilation** based on quantitative or qualitative report
  - Examples: 3-day food record, food frequency questionnaire, or patient self-report
  - Considerations:
    - Gastrointestinal symptoms that impact food intake or absorption (e.g., dysphagia, nausea, vomiting, diarrhea, constipation, abdominal pain, etc.)
    - Presence of malabsorptive disorders (e.g., intestinal failure, pancreatic insufficiency, post-operative bariatric surgery, etc.)
    - Other relevant clinical situations affecting food intake (e.g., esophageal strictures, gastroparesis, intestinal pseudo-obstruction, etc.)
- **Inflammation and Disease Burden** from acute or chronic injury or disease
  - Acute: major infection, burns, trauma, or closed head injury
  - Chronic: malignant disease, chronic obstructive pulmonary disease, congestive heart failure, or chronic kidney disease
  - Supportive laboratory tests: C-reactive protein, albumin, or pre-albumin

HOW TO USE THE GLIM FRAMEWORK

	Phenotypic criteria	Check if present
Unintentional Weight loss (%)	> 5% within past 6 months	
	> 10% beyond 6 months	
BMI (kg/m²)	< 20 if < 70 years (Asia: < 18.5)	
	< 22 if ≥ 70 years (Asia: < 20)	
Muscle mass	Reduced	

	Etiologic criteria	Check if present
Reduced food intake	Ingestion ≤ 50% of needs from 1 to 2 weeks	
	Any reduction for > 2 weeks	
or		
Assimilation	Any chronic GI condition that adversely impacts food assimilation or absorption	
Disease burden/ Inflammation	Presence of acute disease/injury or chronic disease related	

Malnutrition: if at least one criterion was checked in each section

Determine Malnutrition Severity

Severity Grade	Phenotypic Criteria		
	Unintentional Weight Loss (%)	Low BMI (kg/m²) [a]	Reduced Muscle Mass
Stage 1: Moderate Malnutrition Patient requires 1 phenotypic criterion that meets this grade.	• 5-10% in 6 months; or • 10-20% in more than 6 months	• <20 if <70 years; or • <22 if ≥70 years	• Mild-to-moderate deficit (per validated assessment methods on previous page)
Stage 2: Severe Malnutrition Patient requires 1 phenotypic criterion that meets this grade.	• >10% in 6 months; or • >20% in more than 6 months	• 18.5 if <70 years; or • <20 if ≥70 years	• Severe deficit (per validated assessment methods on previous page)

Definitions and Footnotes:
ER= energy requirement; GI= gastrointestinal
[a] Further research is needed for consensus on reference body mass index data for Asian populations in clinical settings.

References:
Jensen, G.L., et al. (2018). *Journal of Parenteral and Enteral Nutrition*, 43(1), 32-40.
Keller, H.H., et al. (2020). *Journal of Parenteral and Enteral Nutrition*, 44(6), 992-1003.

CONSIDERATIONS FOR RESPIRATORY THERAPISTS

***Identifying a patients phenotype (**evaluating the observable characteristics of an individual the observable characteristics of an individual.)

- History of patient- transfer from OSH, current admission, phase of critical illness
- Variable for assessments may be confounded in some patients, specifically if they have been fluid resuscitated
- Oncologic Diagnosis- Pre admission or during admission as many therapies or pathologies have unintended weight loss and decreases in muscle mass
- Excessive body weight (BMI) does NOT protect against malnutrition, in fact, it can mask the loss of muscle mass

CONSIDERATIONS FOR RESPIRATORY THERAPISTS

- **C Reactive Protein (CPR) inflammatory biomarker**
- **Fluid Balances – Excessive losses or gains**
- **Evaluation of repeated CT's (if available) abdomen/pelvis These can be used for quantification of skeletal muscle cross sectional area (CSA) at the level of the third lumbar vertebrae. However, CT"S should NOT be used or repeated strictly for CSA assessment**
- **Ultrasound measures of quadriceps muscle area – Every 1% loss of rectus femoris CSA in the first week of an ICU stay is associated with a 5% increase in the odds of mortality by 60 days**
- **In limited resource areas – calf or mid-upper arm circumference measures may also give an indication of low muscle mass**

SUMMARY

- **Nutrition in the critically ill mechanically ventilated patient is often over looked**
- **Respiratory Therapists should be aware of Phenotyping patients and be able to identify which patients may be at higher risk**
- **Review chart and all available information early and be aware of trends and fluctuations**
- **Patients that travel frequently or often have several bedside procedures are at risk of disruptions and delays in nutrition**
- **Patients that seem to have no identifiable reasons for an inability to wean by have been improperly nourished and have low muscle mass.**

THANK YOU!

Questions?