ASPEN 2022 Nutrition Science & Practice Conference

The Impact of Malnutrition on Clinical Outcomes in Patients Diagnosed with COVID-19

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Disclosures

- No commercial relationships to disclose

Learning Objectives

Upon completion of this presentation, the learner will be able to:

1. Describe the prevalence of malnutrition in patients hospitalized with COVID-19 in a large United States (US) sample
2. Describe the impact of pre-existing malnutrition on mortality and adverse hospital events in patients hospitalized with COVID-19
3. Describe the impact of hospital-acquired malnutrition on mortality and adverse hospital events in patients hospitalized with COVID-19

Background and Aims

Background and Relevance

- COVID-19 Pandemic
  - *476 million cases and 6 million deaths*
- Malnutrition
  - *Weaker immune responses*[1]
  - *Poor diaphragmatic and respiratory function*[2]

Hypothesis

- A history of malnutrition or becoming malnourished during hospitalization is associated with increased mortality and poor clinical outcomes in patients hospitalized with COVID-19 in the US

- 1. Chandra RK. Rosette-forming T lymphocytes and cell-mediated immunity in malnutrition. *Br Med J*. Sep 7 1974;3(5931):608-9. doi:10.1136/bmj.3.5931.608
- 2. Ferrari-Baliviera E, Pierdominici S, Sarcinelli L. [Effects of the nutritional status on the respiratory system]. *Minerva Anestesiol*. Nov 1989;55(11):443-50. Influenza dello stato nutrizionale sull'apparato respiratorio.

Study Rationale

1. Limited data are available assessing prevalence of malnutrition in patients hospitalized with COVID-19 in the US

2. No US studies assessing the impact of malnutrition on outcomes in patients hospitalized with COVID-19

3. Differential effects of pre-existing versus hospital-acquired malnutrition in patients hospitalized with COVID-19 has not been investigated

Study Aims

Specific Aim 1:

- Identify the prevalence of pre-existing and hospital-acquired malnutrition in patients hospitalized with COVID-19 in a large US cohort

Specific Aim 2:

- Determine the association between pre-existing malnutrition on mortality and adverse hospital events in patients hospitalized with COVID-19 in the US

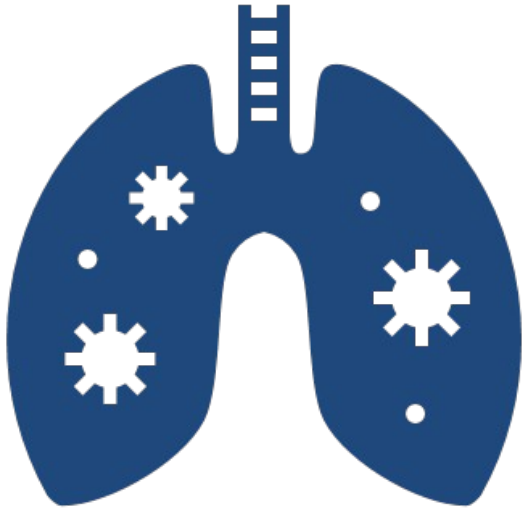
Specific Aim 3:

- Determine the association of hospital-acquired malnutrition on mortality and adverse hospital events in patients hospitalized with COVID-19 in the US

Methods

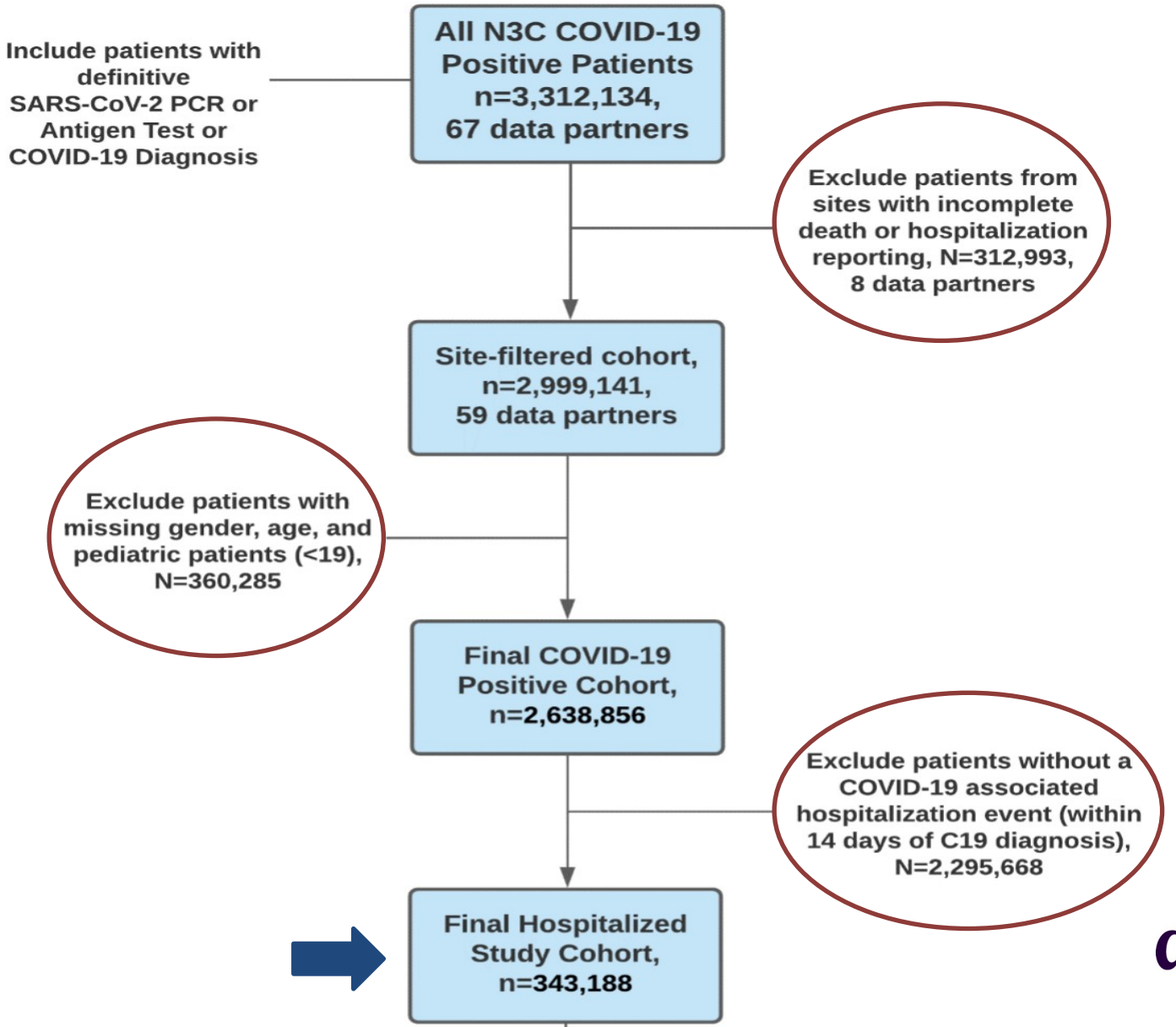
Study Design

- Retrospective Cohort
- National COVID Cohort Collaborative (N3C)[3]
  - *Developed by the NIH*
  - *Longitudinal Electronic Health Records*
  - *Data Partners across the US*
  - *Final data extraction: Dec 2, 2021*
    - Release 55



3. Haendel MA, Chute CG, Bennett TD, et al. The National COVID Cohort Collaborative (N3C): Rationale, design, infrastructure, and deployment. *J Am Med Inform Assoc*. Mar 1 2021;28(3):427-443. doi:10.1093/jamia/ocaa196

Inclusion/Exclusion Criteria



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Primary Exposure: Malnutrition

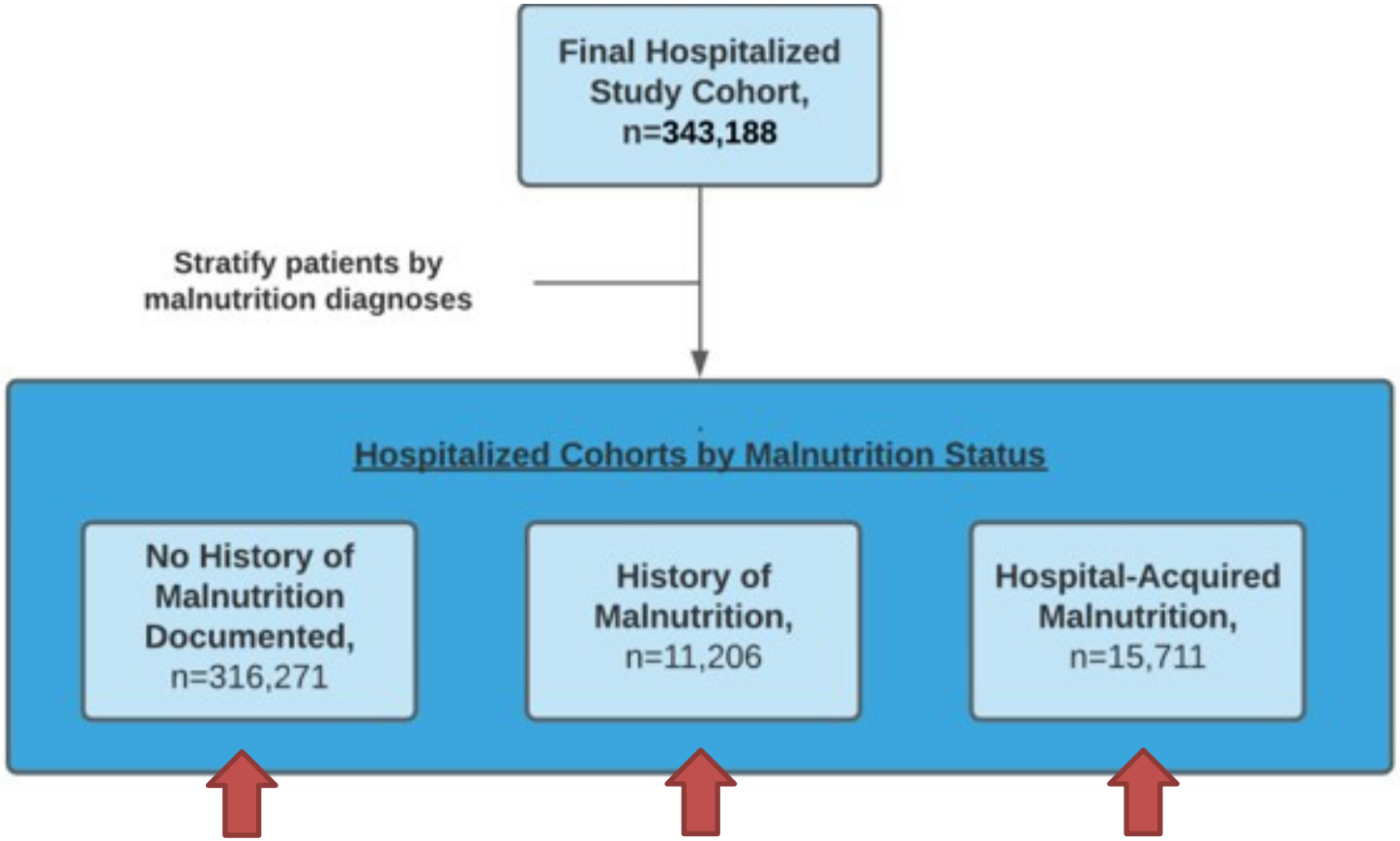
- Defined as the presence of one or more of the following ICD-10 diagnostic codes within the medical record:

Severe protein-calorie malnutrition	Malnutrition of a moderate degree	Moderate protein energy malnutrition	Moderate protein-calorie malnutrition
Mild protein-calorie malnutrition	Malnutrition of a mild degree	Malnutrition following gastrointestinal surgery	Starvation
Semi-starvation	Undernutrition	Deficiency of macronutrients	Nutritional deficiency disorder
Nutritional wasting	Wasting disease	Marasmic Kwashiorkor	Kwashiorkor

1. **History of Malnutrition**
   - *Malnutrition diagnosed prior to COVID-19 Infection*

2. **Hospital-Acquired Malnutrition**
   - *Malnutrition diagnosed on or after COVID-19 Infection*

Patients Categorized into Malnutrition Groups



Outcomes

Mortality

- Death or transfer to hospice

Adverse Hospital Events

- Mechanical Ventilation
- Acute Respiratory Distress Syndrome (ARDS)
- Extra-Corporeal Membrane Oxygenation (ECMO)
- Hospital-Acquired Pressure Injury (HAPI)

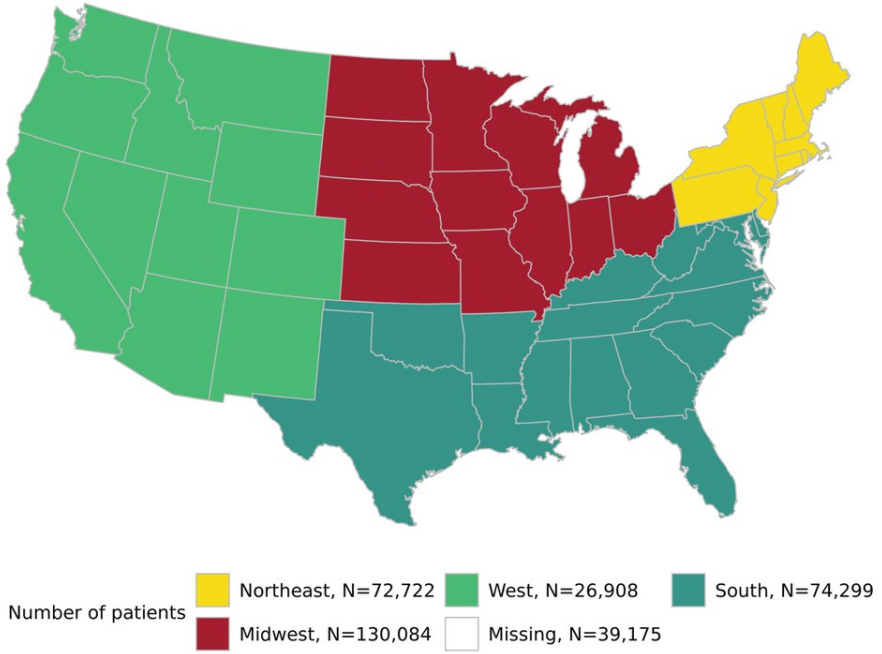
Statistical Analysis

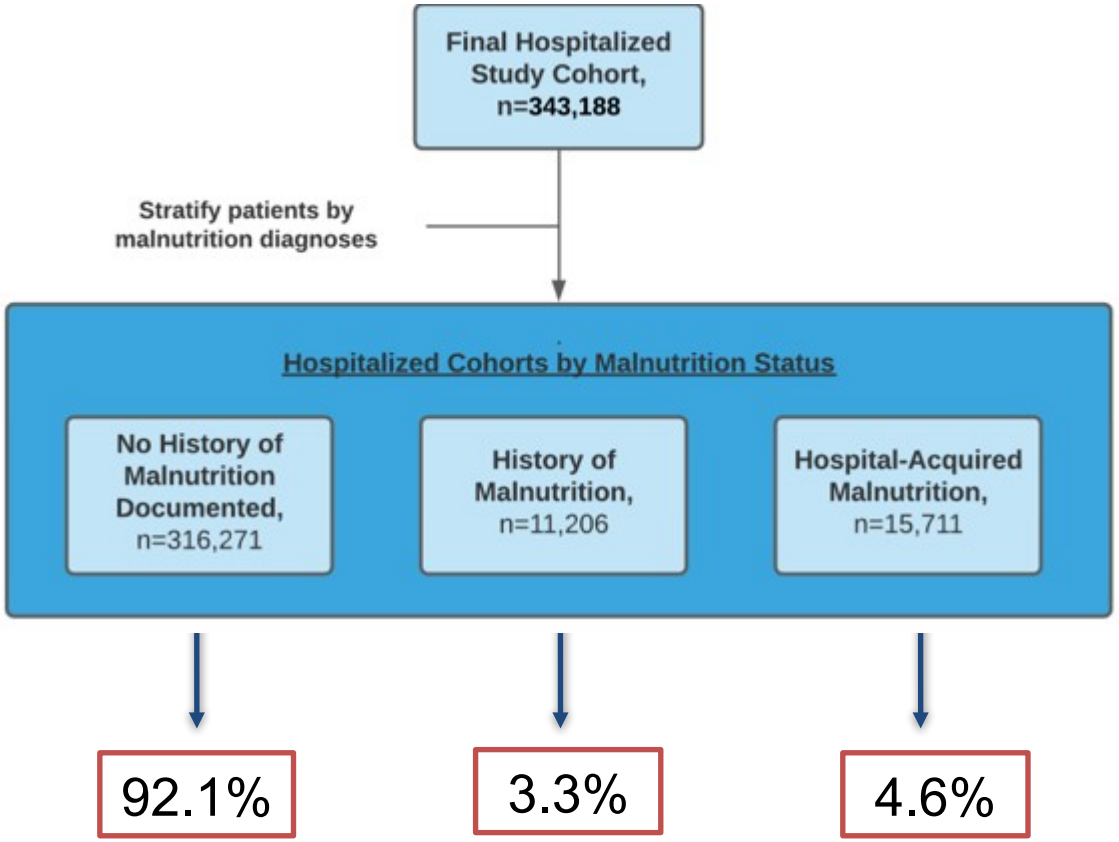
- Frequencies and percentages of demographic and clinical characteristics
- Wilcoxon rank-sum: malnutrition groups and continuous measures
- Chi-squared: malnutrition groups and categorical variables
- Logistic regression models with adjustment: malnutrition and mortality and adverse hospital events
    - Age, sex, race/ethnicity, Charlson Comorbidity Index (CCI), smoking status.

Results

Prevalence of Malnutrition in Patients Hospitalized with COVID-19 in a US Cohort

- 343,188 Patients Hospitalized with COVID-19





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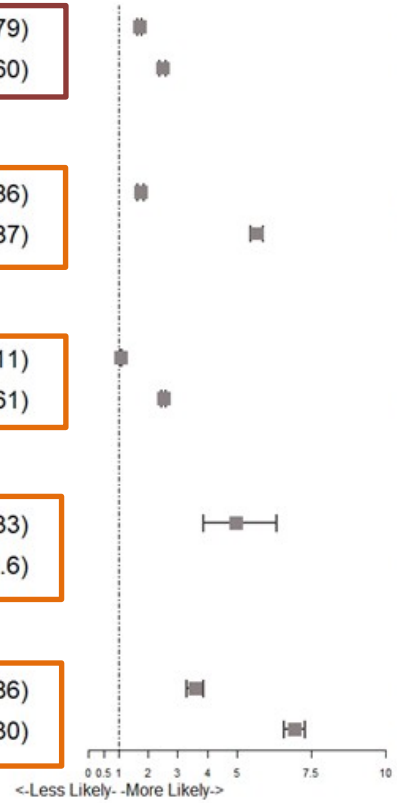
Results: Multivariable Logistic Regression

Adjusted Odds Ratios of Adverse Event by Malnutrition Status in SARS-CoV-2 Infected Persons

Outcome	Malnutrition Status	Adjusted Odds Ratio (95% CI)	p value
Death or Transfer to Hospice	No Documented Hx of Malnutrition (ref)		
	Hx of Malnutrition	1.71 (1.63, 1.79)	<0.001
	HAC Malnutrition	2.50 (2.40, 2.60)	<0.001
Invasive Mechanical Ventilation	No Documented Hx of Malnutrition (ref)		
	Hx of Malnutrition	1.75 (1.65, 1.86)	<0.001
	HAC Malnutrition	5.66 (5.45, 5.87)	<0.001
Acute Respiratory Distress Syndrome	No Documented Hx of Malnutrition (ref)		
	Hx of Malnutrition	1.07 (1.03, 1.11)	0.001
	HAC Malnutrition	2.52 (2.44, 2.61)	<0.001
Extracorporeal Membrane Oxygenation	No Documented Hx of Malnutrition (ref)		
	Hx of Malnutrition	4.97 (3.85, 6.33)	0.001
	HAC Malnutrition	13.1 (11.8, 14.6)	<0.001
Hospital-Acquired Pressure Injury	No Documented Hx of Malnutrition (ref)		
	Hx of Malnutrition	3.58 (3.32, 3.86)	<0.001
	HAC Malnutrition	6.93 (6.57, 7.30)	<0.001



**Adjusted for age, sex, race/ethnicity, CCI and smoking status*
HAC: Hospital-Acquired Malnutrition

Discussion and Conclusion

Strengths and Limitations

Strengths

- First study examining a large US cohort of adult patients hospitalized with COVID-19
  - Prevalence of malnutrition
  - Impact of malnutrition on mortality and adverse hospital events
  - Elucidates variances in outcomes between patients with a history of- or hospital acquired malnutrition

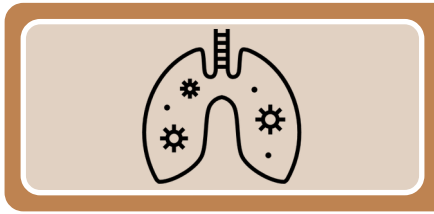
Limitations

- Retrospective data
- Use of ICD-10 diagnostic codes rather than AND/ASPEN criteria

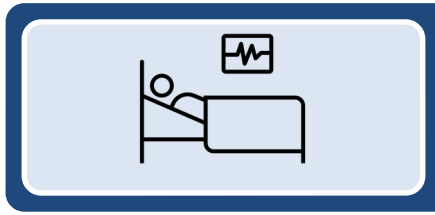
Major Findings

- Patients with malnutrition who were hospitalized with COVID-19

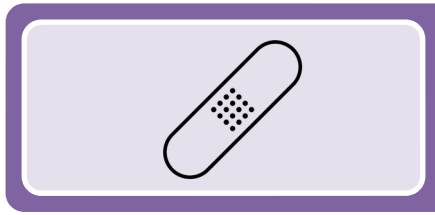
2.5x more likely to die



5.7x more likely to require mechanical ventilation



13x more likely to require ECMO support



6.9x more likely to develop a HAPI

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Conclusion

- **Early and frequent nutrition assessments to ensure accurate malnutrition diagnosis by the interdisciplinary team**
- **Targeted interventions could improve outcomes in patients hospitalized with COVID-19**

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References

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Thank you

Questions?