



Modified NUTRIC Score and Outcomes in Critically Ill Patients: a Meta-Analysis

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in Clinical Nutrition*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سُبْحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

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Dedication

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List of Abbreviations

Abb.	Full term
<i>AND</i>	<i>Academy of Nutrition and Diabetes</i>
<i>APACHE</i>	<i>Acute physiology and chronic health evaluation</i>
<i>ARR</i>	<i>Absolute Risk Reduction</i>
<i>ASPEN</i>	<i>American Society for Parenteral and Enteral Nutrition</i>
<i>BAPEN</i>	<i>British Association for Parenteral, Enteral Nutrition</i>
<i>BMI</i>	<i>Body mass index</i>
<i>CI</i>	<i>Confidence intervals</i>
<i>COPD</i>	<i>Chronic Obstructive Pulmonary Disease</i>
<i>CRP</i>	<i>C-reactive protein</i>
<i>DVT</i>	<i>Deep vein thrombosis</i>
<i>FEM</i>	<i>Fixed-effects method</i>
<i>GIT</i>	<i>Gastrointestinal tract</i>
<i>HCUP</i>	<i>Health care cost and utilization project</i>
<i>HGS</i>	<i>Hand grip strength</i>
<i>ICUs</i>	<i>Intensive care units</i>
<i>MAG</i>	<i>Malnutrition Advisory Group</i>
<i>MNA</i>	<i>Mini Nutritional Assessment</i>
<i>mNUTRIC</i>	<i>Modified NUTRIC score</i>
<i>MST</i>	<i>Malnutrition screening tool</i>
<i>MUST</i>	<i>Malnutrition universal screening tool</i>
<i>NNT</i>	<i>Number Needed to Treat</i>
<i>NRS</i>	<i>Nutritional risk screening</i>
<i>NS</i>	<i>Nutritional screening</i>
<i>NUTRIC</i>	<i>Nutrition Risk in the Critically Ill</i>
<i>REM</i>	<i>Random-effects method</i>
<i>RR</i>	<i>Relative risk</i>
<i>SGA</i>	<i>Subjective Global Assessment</i>
<i>SI</i>	<i>Sarcopenia index</i>
<i>SOFA</i>	<i>Sequential organ system failure</i>

Introduction

Malnutrition was traced back when Florence Nightingale wrote “starving amongst plenty of food” when she described hospitalized soldiers during Crimean war in 1860, after one hundred years **(Butterworth, 1974)** described malnutrition in hospital as “the skeleton in the closet” and he called for recognition and treatment of malnutrition **(Lee and Heyland, 2019)**.

Malnutrition is considered an independent factor for patient mortality and morbidity in hospitals and it’s one of the main cause of increased health care cost. There is no unified definition for malnutrition, also no standard method for screening and assessment so all this defects lead to confusion and varying in practice among doctors across intensive care units (ICUs) in the whole world **(Lee and Heyland, 2019)**.

The importance of the role of inflammation as a major risk factor recently has been recognized. The stress of the catabolic state make the critically ill patient at a high risk to develop malnutrition adding to it delayed or inadequate nutritional assessment. Iatrogenic under feeding with or without preexisting malnutrition will leads to increased risk

of complication such as increased 28-days mortality, ICU length of stay and also increased days on mechanical ventilation **(Lee and Heyland, 2019)**.

Joint commission international (JCI), they give international certification and accreditation in more than one hundred countries. They work to improve quality of health care and patients safety by offering advisory services and education, one of their requirements to give this certificate for hospitals is the presence of nutrition team to follow up the patients nutrition to avoid hazards of malnutrition.

It was thought that serum proteins as albumin and prealbumin are markers for malnutrition, the current role is that laboratory markers by themselves are not reliable markers for malnutrition but can be used as a complement during diagnosis of malnutrition. Recent studies suggest using mNUTRIC score for screening and subjective global assessment for nutritional assessment and to complement with other parameters available in each critical care setting such as laboratory markers, sarcopenia index and hand grip strength **(Brantley and Mills, 2012)**.

Especially in critically ill patients nutritional status is strongly linked to clinical outcomes. Screening of nutritional status in ICU patients is not a straight forward processes this is due to most of nutritional screening tool used for

hospitalized patients not suitable for critically ill patients because important parameters such as accurate history of dietary intake and weight loss is difficult to obtain as most of them either sedated or on mechanical ventilation and change in weight can be affected by edema due to underlying disease or by large volume of fluids for resuscitation to maintain hemodynamic stability **(Lee and Heyland, 2019)**.

Nutritional management should include: these parameters: Screening, assessment, monitoring & outcome, communication and audit **(White et al., 2012)**.

Early diagnosis and accurate detection of patients who are at risk of malnutrition followed by proper management is mandatory. Role of inflammation and its effect on the nutritional status of ICU patients should be considered **(Tappenden et al., 2013)**.

Aim of the Work

This meta-analysis study has been done to evaluate the mNUTRIC as a screening tool for nutrition risk in critically ill patients. And the association between the score and 28 days mortality as a primary outcome and ICU length of stay, days on mechanical ventilation and rate of infection as secondary outcomes.

Chapter (1)

Malnutrition in ICU

Usually malnutrition in critically ill patient is an acute condition and its definition varies among year, between organization and individual researchers but broadly malnutrition was described as nutritional status where there is either lack or excess of micro and/ or macronutrients that may have bad effect on body size, function, composition and also the clinical outcomes in ICU so malnutrition includes under and over nutrition. Another simple expressing definition of acute malnutrition in ICU is decreased in food intake or illness resulting in edema and weight loss. Usually in critical care setting undernutrition is the main cause of malnutrition **(Hamilton and Boyce, 2013)**.

Malnutrition leads to unfavorable consequences in ICU patients such as increase infection rate, increased readmission and prolonged morbidity, increased days on mechanical ventilation. The intensivist facing two categories of patients coming to the ICU healthy category as regard their nutritional status such as traumatic patients **(Hamilton and Boyce, 2013)**. In contrary, the other category of patients coming to the ICU patient with non health background as regard their nutritional already critically ill with advanced

internal or surgical problem such respiratory, metabolic disease, prolonged cancer. So nutritional status will be different among the two types of patients coming to the ICU, traumatic patients considered healthy one. So nutritional status usually will be normal (NACNS, 2017).

Prevalence of malnutrition

High prevalence of malnutrition was estimated in hospitals especially among ICU patients, its estimated that malnutrition impacts at least 1 in 3 patients in developing countries at the hospital admission. If its neglected more and more patients nutritional status will decline and they become malnourished during their hospital stay. Recently in multiple Australian studies reported that malnutrition prevalence was 12-53% in acute critically ill patients (Kirkland et al., 2013).

Health care cost and utilization project (HCUP) in 2013 identified malnutrition as some diagnostic codes: which are nutrition's neglect, protein – calorie malnutrition, cachexia, post surgical malnutrition under weight, weight loss and failure to thrive. The most common type is protein calorie malnutrition (63.9%). So more work is needed to recognize malnutrition in hospitalized patients especially in ICU and to treat malnutrition properly (Weiss et al., 2009).

Also, HCUP found that patients impacted by malnutrition during their hospital stay most frequently include patients more than 65 years old, lower socioeconomic and environmental condition of the patients, already under weight, long duration of illness, diarrhea of illness, type, severity of organ system dysfunction **(Weiss et al., 2009)**.

Pathophysiology of malnutrition:

Two main causes lead to malnutrition in ICU patients stress catabolism and inadequate intake. It can be explained through the pathophysiology of critical illness which divided into two phases early phase secretion of catabolic hormones such as (glucagon, cortisol, catecholamines), they act to mobilize (muscle and adipose tissue) for generation of glucose-amino acids and free fatty acids for energy yielding. Further, catabolism due to secretion of proinflammatory cytokines TNF α IL-6 as a result of acute insult in the body so critical ill patients are at high risk to develop malnutrition especially if the patients before insult has some sort of malnutrition due to any cause such as chronic illness or cancer and the second stage which is loss of body cell mass and at this stage priority to maintain vital organ system functions and hence increase risk of malnutrition in critical ill patients especially if malnutrition already present before the acute insult so degree of malnutrition is different according to the patient status and medical history **(Lee and Heyland, 2019)**.