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CASE REPORT

MALNUTRITION AND NEW CROWNS

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ABSTRACT

Under-nutrition remains a problem for viral pandemics of the twenty-first century and beyond. Malnutrition in critically ill patients is associated with poor outcomes, including impaired wound healing, higher rates of nosocomial infections, and all-cause mortality. This review aims to provide a clear picture regarding the interaction of malnutrion with COVID-19 from the early step of nutritional screening up to nutritional management

Malnutrition is in general described as an insufficient intake of nutrients or calories for suitable physiological functioning. Undernourishment specially indicates to hypo caloric intake in addition to reduced macro- and micronutrient intakes relative to the calculated recommendation for a patient. Severe malnutrition is defined as less than of 50% of estimated energy requirements for more than five days, and moderate malnutrition is defined as less than 75% of estimated energy requirements for more than 7 days. (1) Getting 80–90% of recommended protein and calories in ICU patients is both achievable and is correlated with the beneficial physiological and increase the clinical outcomes in a significant proportion of patients. To maximize these benefits as well as minimizing the risk of enteral nutrition are essential the strategies that should done include early initiation of enteral nutrition (within 24–48 hours), adoption of second-generation feeding protocols, use of motility agents, small bowel feeding tubes, and elevation of the head of the bed. (2) The hospital nutritional care is a pathway that supports the detection, prevention and treatment of malnutrition. Key activities to reach these goals are; Screening, Assessment, nutritional care and monitoring. The post-acute care includes rehabilitation or palliative services that beneficiaries receive following a stay in an acute care hospital.(3)

Depending on the patient's needs, treatment may include a stay in a facility, such as a skilled nursing facility, inpatient rehabilitation facility (that should be available in our community now as an emergency response to COVID-19), or long-term care hospital, or care in the home via a home health agency, that already found. Coronaviruses (CoVs) are large family viruses that cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). A novel coronavirus (nCoV) is a new strain that has not been previously identified in humans. Nutrition is one of the host factors that correlated with variations in influenza morbidity and mortality. (4, 5) This review aims to discuss the malnutrition among COVID-19 patients.

METHODOLOGY

Google Scholar search engine was used to gather information relating to Coronavirus, COVID-19, malnutrition, nutritional assessment, and nutritional care management. The studies were written in English. The period of literature age has extended from the inception of the search engine to the mid of March 2020. The search generated about 297 sources, of which 35 sources were used. These 35 articles were considered relevant because they answered the objectives of the review. The library databases such as PubMed and MEDLINE were also used during the study.

DISCUSSION

Patients with COVID-19 have different degrees of psychological pain which they may mild, moderate or severe, such as uncomplicated Illness-runny nose, fever, cough, headache, sore throat, the mild symptoms like breathing difficulty, inflammation in the lungs and the Severe symptoms like acute respiratory distress syndrome and septic Shock.

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Psychological intervention can be conducted in different ways to improve psychological pain and improve the treatment effect. (2, 3)It is recommended that, all patients with new crowns should receive comprehensive psychological intervention, including telephone psychological counseling (active and passive), self-adjustment of written materials and one-to-one psychological crisis intervention.When deciding on criteria for hospital discharge of COVID-19 patients, health authorities should take into account several factors such as the existing capacity of the healthcare system, laboratory diagnostic resources, and the current epidemiological situation. Recommendations Steps for Nutritional Assessment

Nutrition assessment, as defined by the American Society for Parenteral and Enteral Nutrition (ASPEN), uses medical, nutritional and medication histories, anthropometric measurements, physical examination, and laboratory data to characterize the nutritional status of patients. (4) This global approach to nutrition assessment, including dietary history, clinical status, and social history, recognizes the fundamental relationship between nutritional status and severity of the illness. Nutritional assessment helps identify patients who are at nutritional risk, meaning patients who either have actual malnutrition or who have the potential to become malnourished. The best approach involves the uses of several parameters for screening patients since no single parameter is a good indicator. The overall consensus of the American Dietetic Association (ADA) and ASPEN recommends two or more of the following six characteristics for the diagnosis of adult patients having either severe or non-severe malnutrition: insufficient energy intake, weight loss, loss of muscle mass, loss of subcutaneous fat, localized fluid accumulation that can mask weight loss, and diminished functional status as measured by hand grip strength, see figure 1. (5)

Regarding to the SGA the nutrition risk screening is an important step in identifying patients at risk for malnutrition. It is recommended to select a short, valid and reliable form for emergency care. The suitable tool should be used for COVID - 19 patient admitted to the words is NRS (2002). Nutritional risk assessment must be also done on all critically ill patients. Malnutrition in intensive care unit (ICU) patients is associated with adverse clinical outcomes. Traditional scoring systems cannot be used for screening in mechanically ventilated (MV) patients, so the appropriate nutritional assessment tool in MV patients is NUTRIC score (modified without ILK-6). This type of screening should be applied by ICU multidisciplinary team,(6, 7)

Nutritional Care Pathway

According to ASPEN Standards of Care for Hospitalized Patients, All patients that admitted to the hospitals should undergo to these steps shown in Figure 2 to know their nutritional status, by dietitians in cooperate with multidisciplinary team.[4]

SUBJECTIVE GLOBAL ASSESSMENT RATING FORM

Patient Name: **ID #:** **Date:**

HISTORY

WEIGHT/WEIGHT CHANGE: ***(Included in K/DOQI SGA)*** — **Rate 1-7**

1. **Baseline Wt:** _____(Dry weight from 6 months ago)
   Current Wt: _____(Dry weight today)
   Actual Wt loss/past 6 mo: _____ **% loss:**_____(actual loss from baseline or last SGA)
2. **Weight change over past two weeks:** _____No change _____Increase _____Decrease

DIETARY INTAKE No Change_____(Adequate) No Change_____(Inadequate)

1. Change: Sub optimal Intake: _____ Protein _____ Kcal _____ Duration_____
   Full Liquid: _____ Hypocaloric Liquid _____ Starvation _____

GASTROINTESTINAL SYMPTOMS ***(Included in K/DOQI SGA-anorexia or causes of anorexia)***

Symptom:	Frequency:*	Duration:*
_____ None	_____	_____
_____ Anorexia	_____	_____
_____ Nausea	_____	_____
_____ Vomiting	_____	_____
_____ Diarrhea	_____	_____

Never, daily, 2-3 times/wk, 1-2 times/wk > 2 weeks, < 2 weeks

FUNCTIONAL CAPACITY — b

Description	Duration:
_____ No Dysfunction	_____
_____ Change in function	_____
_____ Difficulty with ambulation	_____
_____ Difficulty with activity (Patient specific "normal")	_____
_____ Light activity	_____
_____ Bed/chair ridden with little or no activity	_____
_____ Improvement in function	_____

DISEASE STATE/COMORBIDITIES AS RELATED TO NUTRITIONAL NEEDS

Primary Diagnosis_____Comorbidities_____

Normal requirements ____Increased requirements____ Decreased requirements _____

Acute Metabolic Stress: _____None _____Low _____Moderate _____High

PHYSICAL EXAM

_____ Loss of subcutaneous fat (Below eye, triceps, ____Some areas _____All areas biceps, chest) ***(Included in K/DOQI SGA)***

_____ Muscle wasting (Temple, clavicle, scapula, ribs, ____Some areas _____All areas quadriceps, calf, knee, interosseous ***(Included in K/DOQI SGA)***

_____ Edema (Related to undernutrition/use to evaluate weight change)

OVERALL SGA RATING

Very mild risk to well-nourished=6 or 7 most categories or significant, continued improvement.

Mild-moderate = 3, 4, or 5 ratings. No clear sign of normal status or severe malnutrition.

Severely Malnourished = 1 or 2 ratings in most categories/significant physical signs of malnutrition.

Figure 1 The Subjective Global Assessment Rating Form[8]

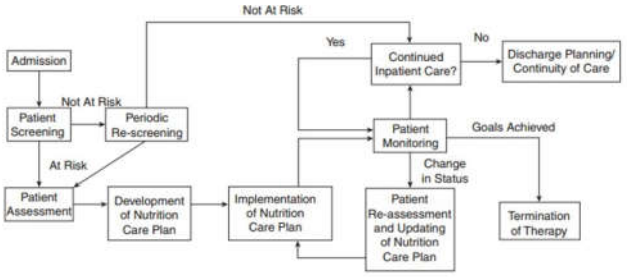

Figure 2 Nutritional Care Algorithms (Adapted from ASPEN Nutritional Care Pathway in Hospitals)

Energy Calculation

Current energy intake compared with estimated energy requirements is a primary standard in assessing malnutrition. When clinicians obtain the nutritional history and present illness from patients, they should estimate the energy requirements and compare them to the actual energy intake. In state of ICU patients with COVID-19 the energy requirement ERR recommended to be measured by Capnography VCO2 (REE kcal =VCO 2 × 8.19), and use a published predictive or weight based (25 – 30 kcals/kg/d) equation to determine energy requirements in state they can't calculate by indirect calorimetric. (9, 10)

Interpretation of weight loss/physical findings

One standard parameter for evaluating changes in nutritional status involves review of the usual weight of an individual is Ideal Body Weight. (11) The (IBW), a comparison of the patient's current weight for height to the ideal body weight, can be used as a quantifying tool in the nutrition assessment process. Interpretation of the IBW is as follows: 80-90% IBW is considered mild malnutrition, 70-79% is considered moderate malnutrition, and ≤ 69% is considered severe malnutrition. (9, 11)

Weight comparisons in adults can indicate severity of malnutrition and the percentage of weight lost from the usual baseline weight can be used as a parameter for malnutrition assessment. In adults with acute illness or injury, severe malnutrition is associated with an involuntary weight loss of >2% of usual body weight within 1 week, >5% weight loss within 1 month, and >7.5% weight loss in 3 months. (8) Moderate malnutrition is identified by a 1-2% weight loss within 1 week, a 5% weight loss within 1 month, and a 7.5% weight loss within 3 months. Careful evaluation of other factors affecting weight, such as hydration status, should be reviewed during this assessment. (12)

Protein Intake

Muscle wasting is the most important features for malnutrition; protein energy malnutrition occurred with moderate loos of protein intake especially in the buttocks, temples, clavicles, scapula, clavicles, and calf muscles in severely malnourished patients in critical care units. (13) Nitrogen balance studies evaluate the adequacy of protein intake relative to need. Nitrogen metabolism is dependent on both energy and protein intake, and increasing energy intake often improves nitrogen balance. Increase high-quality protein and branched chain amino acids BCAA such as whey protein and other animal proteins, one of the most important strategies to dealing COVID-19 patient to improve their needs from protein and reduce risk of malnutrition. For that it's the appropriated target should reaches to 50% of the total protein the range start from 1.2 -2 g/kg/24h , it is more beneficial to which can not only significantly inhibit muscle breakdown, but also improve insulin resistance and enhance the efficacy of interferon. (13,14)

Fluid Balance

In hospitalized patients, accurate interpretation of changes in weight can be complex, and clinicians must consider all factors that can contribute to weight changes during hospitalization. In the critically ill patients inflammation may cause fluid shifts which affect the body weight. For example, fluid shifts from the intravascular space to the extravascular space and from the intracellular space to the extracellular space with a concurrent decline in lean body mass can occur in malnutrition with little obvious change in weight. In addition, diuretic and resuscitation therapy, edema, ascites, and other fluid alterations can significantly alter body weight within short time periods and can conceal real changes in body weight. (9, 12)

The minimum amount of fluid for critically ill patients to meet the main nutrient requirements, within limits is 3 ~ 5 mL / kg (calculated as 4 mL / kg) for every 1 ° C increase in body temperature. Most patients with new crown crises have pulmonary edema and fluid accumulation. While maintaining fluid balance, it is even more necessary to prevent excess fluid, especially intravenous fluid volume. (15)

Supplementations (ONS and Vitamins and Minerals)

Oral nutrition supplement should be used whenever possible to meet COVID-19 patient's needs, when dietary counseling and food fortification are not sufficient to increased dietary intake and reach nutritional goals especially in pre-intubated period. The new crown critically ill patients, should a conventional multiple-micronutrient supplementation, in particular vitamin B1, vitamin C, selenium, zinc, as the reference standard normal dosage recommended nutrient intake values. Micronutrients are recommended to be part of total parenteral nutrition management. (16)

Nutrition Support for Malnutrition COVID-19 Patients in ICU

In general theprinciples of nutrition treatment options and approaches for critically ill patients with COVID-19 start from orally allowed till parenteral in state of worse cases, see Figure 3. (17) According to the recent European Society Parenteral and Enteral Nutrition ((ESPEN)) guidelines on nutritional therapy in Intensive Care Unit (ICU) and the respiratory therapy stages; the nutritional management is guided by the patient's condition. The nutritional management should consider the respiratory support allocated to the ICU patients to prevent the occurrence of malnutrition. (18)

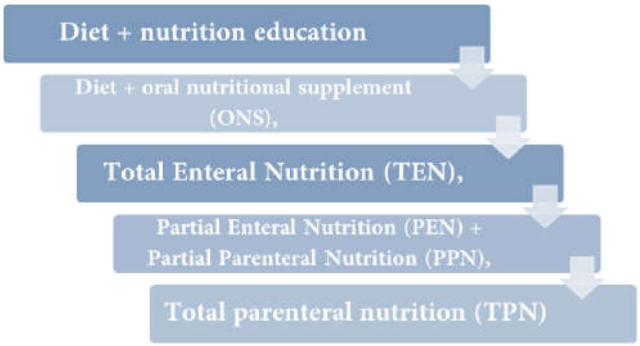

Figure 3 Principles of nutrition treatment options and approaches for critically ill patients with COVID-19

The enteral nutrition Nasogastric Feeding should be started during the first 24-48 hours of admission. For highly inadequate implementation of enteral nutrition which may result in patient starvation particularly in the first 24 hours of ICU stay and higher risk of malnutrition and associated complications; the peripheral parenteral nutrition may be therefore used under these conditions. [19]

Feeding for malnutrition COVID-19 patient should be initiated with low dose of enteral feeding, that is called hypocaloric or trophic, advancing to full dose EN slowly over the first week of critical illness to meet energy goal of 15-20 kcal/kg actual body weight (ABW)/day (which should be 70-80% of caloric requirements) and protein goal of 1.2-2.0 gm/kg ABW/day. Sometimes the parenteral nutrition is necessary, conservative dextrose content and volume should be used in the early phase of critical illness, slowly advancing to meet the same energy goals as outlined above. [17] While energy requirements can ideally be determined by indirect calorimetry, the principle of "clustering" of care is particularly important and we recommend instead using weight-based equations to estimate energy requirements as a practical matter for the COVID-19 patients. Nutrition requirements should take into consideration the use of propofol in terms of lipid calories and total calories needed. [20, 21]

Common Complication of Suddenly Refeeding Malnourished Patients

Refeeding Syndrome

Refeeding Syndrome defines as a range of metabolic and electrolyte alterations occurring as a result of the reintroduction and/or increased provision of calories after a period of decreased or absent caloric intake. The diagnostic criteria for RS as a follow; decrease in serum phosphorus, potassium, and/or magnesium levels by 10%–20% of normal this mean mild RS, decrease 20%–30% means moderate RS, and >30% and/or organ dysfunction resulting from a decrease in any of these and/or due to thiamine deficiency (severe RS) [22, 23]

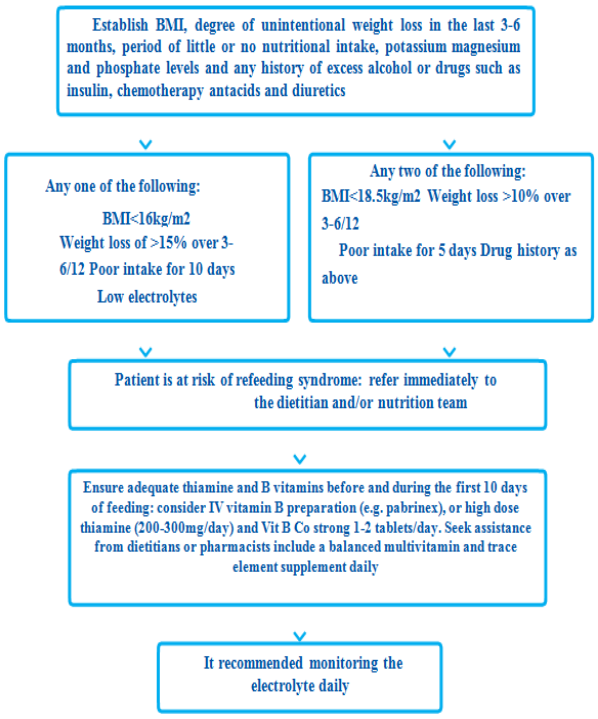

Figure 4 Guidelines for Patients who at risk [24]

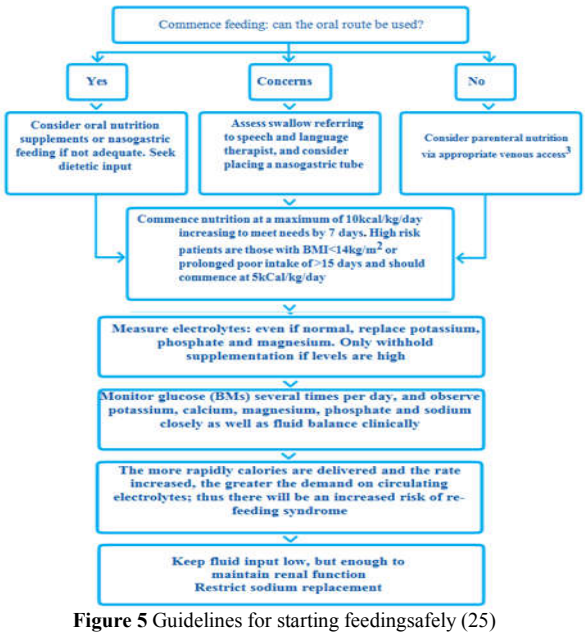

Figure 5 Guidelines for starting feedingsafely (25)

Monitoring of malnutrition patient

Effective nutritional monitoring is a vital tool to reduce the incidence of complications, reduce electrolyte and metabolic abnormalities and ensure adequate nutrition is delivered. The frequency of monitoring and parameters measured will be dependent on the diagnosis and underlying clinical condition of the patient; duration and tolerance of enteral feeding; and rationale for feeding. Nutritinal monitoring will also vary according to the clinical setting and availability of appropriate expertise. [26,27]

Nutritional monitoring should be done by suitably trained health care professionals, however patients on long term enteral feeding and their carers should be educated to monitor parameters such as bowels, weight and nutritional intake; identify potential problems; and report concerns to the relevant health care professional as needed. The goals of nutritional support should also be regularly reviewed. [28]

Table 1 Enteral Feeding Monitoring [29]

Parameter	Frequency	Rationale
Food chart (if appropriate)	Daily	To compare intake with requirements and aid transition between nutrition support and oral intake.
Fluid balance charts	Daily in acute setting including fluid delivered by other routes e.g. medications/ IV fluids/ feed flushes and oral fluids. Urine frequency and colour should be monitored in community patients.	Help assess hydration status. To compare feed given with feed prescribed. To assess fluid volume prescribed with volume given To assess if feed rest periods are adhered to.
Weight/BMI	Twice weekly, or more frequently if hydration concerns. Monthly for established home enteral feeding If weight difficult to obtain use mid-arm circumference and tricep skinfold thickness	To assess changes on hydration and body composition over time.
Temperature/pulse/ respiration	Daily when in acute unit	To monitor overall condition and monitor for signs of infection/dehydration.
Bowels	Daily	To monitor bowel function and tolerance of enteral feed.
Capillary blood glucose	Random daily initially until stable, four hourly if unstable or has diabetes.	To detect hyper/hypo glycaemia To ensure timing of feed and medication optimal for blood glucose control.
Nausea and vomiting	Daily	Monitor tolerance of feed.
Gastric residual volumes	4 hourly where clinically indicated in acute setting.	In some units used to assess gastric emptying and ascertain appropriateness of increasing feed rate.

Feeding tube position	NG tubes before each feed, fluid or medication administration.	To confirm gastric position and prevent feed aspiration.
	Long term feeding tubes (gastrostomy/ jejunostomy) before each feed begins noting external bumper markings.	To ensure feeding tube has not migrated from/into stomach.
Feeding tube insertion site	Daily	To check for infection/ soreness/ leakage. Check for nasal erosion with nasal placed tubes. To ensure tube appropriately secured
General clinical condition of patient	Daily	To ensure feed is tolerated and that feeding and feeding route remain appropriate.

Monitoring patients on parenteral nutrition (PN) requires a multidisciplinary approach with effective communication throughout the team. This will help to minimise potential complications, and will aid safe, effective and appropriate use of PN. The team should include, at minimum, input from a Doctor, Nurse, Dietitian and Pharmacist, all experienced in PN. [30, 31]

When establishing a new patient on PN, daily review is recommended until the patient is stable in terms of electrolytes, nutrient provision and fluid balance. Achieving stability requires detailed, timely review, with appropriate alterations made to the PN. [32]

Table 2 Parenteral Feeding Monitotring [33-35]

Parameter	Frequency	To assess
Weight	Daily if fluid balance concerns. Otherwise weekly.	Fluid balance and nutritional status.
Height	Baseline. Review with growth/degeneration.	Body Mass Index
BMI	Baseline then repeated if dry weight or height changes.	Nutritional status
Mid-arm circumference	Baseline, then monthly	Estimate body composition and function.
Biochemistry	Baseline, daily then at each review once stable.	See biochemistry section below.
Temperature	Daily	Signs of sepsis and review fluid requirements.
Fluid balance	Daily, then at each planned review once stable.	Hydration and compare nutrition prescribed vs delivered.
Blood glucose	Baseline, 1-2 times/day then at each review. If has diabetes, follow local policy.	Glycaemic control. Signs of sepsis. Rebound hypoglycaemia if PN timings change or if PN stopped.
Clinical condition and medical plan	Daily initially, reducing to twice weekly once stable	Whether goals of PN are being met. Nutritional requirements. Appropriateness of PN and manage potential complications.
Medications	Baseline then at each review once stable	Drug-nutrient interactions. Establish whether medications are affecting gastro-intestinal function/clinical condition.
GI function and enteral intake	Daily initially, reducing to twice weekly	Ability to take enteral nutrition. Tolerance to enteral nutrition. Establish the amount of PN required to meet nutritional needs.

Table 3 The Typical clinically significant adjustments[34]

Electrolyte	Typical clinically significant adjustments
Sodium	Multiples of 40mmol. 50-100+mmol if severe GI losses/short bowel
Potassium	Multiples of 20mmol. May need 100+mmol/day in severe GI losses
Magnesium	Multiples of 5-10mmol. May need 15mmol or more in severe GI losses
Phosphate	Multiples of 10mmol
Calcium	Multiples of 2.5-5mmol

Competing interests: Authors have declared that no competing interests exist.

CONCLUSION

It is important to assess mange and take care of malnourished COVID-19patients. More research are need to be analyzed on the interaction of nutritional status on COVID-19.

Reference

1. Kondrup J. Can food intake in hospitals be improved? Clin Nutr. 2001; 20:153-160.
2. SINGER P, BLASER AR, BERGER MM, *et al*. ESPEN guideline on clinical nutrition in the intensive care unit. *Journal of Clinical Nutrition*, 2019, 38 (1): 48-79.
3. McClave S, Martindale R, Vanek V, McCarthy M, Roberts P, Taylor B, *et al*. Guidelines for the provision and assessment of nutrition support therapy in the adult critically Ill patient. *Journal of Parent Enteral Nutrition*. 2009;33:277–316.
4. A.S.P.E.N. Board of Directors and Standards Committee. Definition of terms, style and conventions used in A.S.P.E.N. guidelines and standards. Nutr Clin Pract 2005; 20:281-285.
5. Elia, M. Screening for malnutrition: a multidisciplinary responsibility. development and use of the 'malnutrition universal screening tool' ('MUST') for adults. Bapen.org.uk. 2003 [cited 28 March 2020]. Available from: http://www.bapen.org.uk.
6. Kondrup, J.E.S.P.E.N., Allison, S.P., Elia, M., Vellas, B. and Plauth, M., 2003. ESPEN guidelines for nutrition screening 2002. *Clinical nutrition*, *22*(4), pp.415-421.
7. Mukhopadhyay A, Henry J, Ong V, Leong C, Teh A, van Dam R, *et al*. Association of modified NUTRIC score with 28-day mortality in critically ill patients. Clin Nutr. 2016;S0261- 5614:30201–1.
8. de Vries, M.C., Koekkoek, W.K., Opdam, M.H., van Blokland, D. and van Zanten, A.R., 2018. Nutritional assessment of critically ill patients: validation of the modified NUTRIC score. *European journal of clinical nutrition*, *72*(3), pp.428-435.
9. White JV, Guenter P, Jensen G, *et al*. Consensus statement: Academy of nutrition and dietetics and American Society for Parenteral and Enteral Nutrition: Characteristics recommend for the identification and documentation of adult malnutrition (under nutrition). JPEN J Parenter Enteral Nutr 2012; 36:275.
10. van Herpen, C.H., van Blokland, D.A. and van Zanten, A.R., 2019. Metabolic effects of beta-blockers in critically ill patients: A retrospective cohort study. *Heart & Lung*, *48*(4), pp.278-286.

11. Elfagi S, Nouh F, Omar M.Chronic Obstructive Pulmonary Diseases Nutritional Guideline. *EAS Journal of Nutrition and Food Sciences*. April 2020; (2): 55-61
12. Allard JP, Keller H, Jeejeebhoy KN, Laporte M, Duerksen DR, Gramlich L, Payette H, Bernier P, Vesnaver E, Davidson B, Teterina A, and Lou W. Malnutrition at hospital admission – contributors and effect on length of stay: a prospective cohort study from the Canadian Malnutrition Task Force. *Journal of Parenteral and Enteral Nutrition*. Downloaded from pen.sagepub.com on March 27, 2020
13. Elfagi S, Elmabsout A, Eltohame E, Sachithananthan V.Association between nutritional risk factors and types of gallstone in Benghazi, Libya. *International Journal of Nutrition and Public Health*. 2019; (1):1-9
14. Pierre Singer a, *, Annika Reintam Blaser b, c, Mette M. Berger d, Waleed Alhazzani e, Philip C. Calder f, Michael P. Casaer g, Michael Hiesmayr h, Konstantin Mayer i, Juan Carlos Montejo j, Claude Pichard k, Jean-Charles Preiser l, Arthur R.H. van Zanten , Simon Oczkowski e, Wojciech Szczeklik n, Stephan C. Bischoff.ESPEN guideline on clinical nutrition in the intensive care unit. Clinical Nutrition 38 (2019) 48e79.
15. World Health Organization. Coronavirus disease 2019 (COVID-19): situation report, 51.
16. Singer P, Blaser AR, Berger MM, Alhazzani W, Calder PC, Casaer MP, *et al*. ESPEN guideline on clinical nutrition in the intensive care unit. Clin Nutr 2019;38:48e79
17. Omar M, Elfagi S, Nouh F. Covid-19 and Nutrition: Review of Available Evidence. Scholars Journal of Applied Medical Sciences 8 (4), 1158-1164.
18. Nouh F, Elfagi S, Omar M. Corona virus: the Paradox between Food Insecurity and Weight Gain. EAS Journal of Nutrition and Food Sciences 2 (2), 39-43
19. Madi MF, Elfagi S, Nouh F, Elramli S, Omar M. Coronavirus Nutritional Care Protocol. Scholars *Academic Journal of Biosciences* 8 (4), 97
20. Nouh F, Omar M, Younis M, Younis M, Mohamed R, Reyad W. Nutritional status of lung cancer patients in Benghazi City of Libya. *Journal of Cancer and Tumor International*. 2017 Dec 5:1-0.
21. Omar M, Nouh F, Younis M, Elmabsout A. Weight Change during Hospitalization: Recognition of Risk Factors. Prospective Study at Benghazi Medical Center. *Journal of Advances in Medicine and Medical Research*. 2017 Sep 20:1-3.
22. Allaparthi S BD, Canada N, *et al*. *A.S.P.E.N. Fluids, Electrolytes, and Acid-Base Disorders Handbook*. Silver Spring, MD: American Society for Parenteral and Enteral Nutrition; 2015.
23. Omar M, Nouh F, Younis M, Younis M, Nouri N, AhmedA, Mohamed A, Mohamed A. Refeeding Syndrome. SAS Journal of Medicine 3 (11), 307-312
24. Elfagi S. assessment of nutritional status of elderlywomen in Benghazi, Libya. *International Journal of Nutrition and Public Health*. 2018;1(1)
25. Elfagi S,Nouh F, Omar M.Dietitian Role in Parenteral Nutrition Administration among a Multidisciplinary Team.*Scholars Journal of Applied Medical Sciences*. 2020 April: 6:1165-1169
26. Centers for Disease Control and Prevention. Interim Guidance for Implementing Home Care of People Not Requiring Hospitalization for 2019 Novel Coronavirus (2019-nCoV). Updated Janury 31, 2020.
27. NationalCollaboratingCentreforAcuteCare,February2006 . Nutrition Support in adults. Oral nutrition support, enteral tube feeding and parenteral nutrition. Methods, evidence andguidance.
28. SPEN Guidelines on Parenteral Nutrition: Home Parenteral Nutrition (HPN) in adult patients. (2009)
29. NCEPOD PN: A mixed bag report. National confidential enquiry into patient outcome and death. (2010)
30. NICE (2006) Nutrition support in adults: Oral nutrition support, enteral tube feeding and parenteral nutrition.
31. NICE (2013) Intravenous fluid therapy in adults in hospital.
32. Austin, P and Stroud, M (2007) Prescribing Adult Intravenous Nutrition. RPS publishing. London.
33. Rochester DF. Malnutrition and the respiratory muscles. Clinics in chest medicine. 1986 Mar;7(1):91-9.
34. Rochester DF, Esau SA. Malnutrition and the respiratory system. Chest. 1984 Mar 1;85(3):411-5.
35. British Dietetics Association (BDA) (2012) Model and Process for Nutrition and Dietetic Practice. https://www.bda.uk.com/publications/professional/model

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