B BRAUN
SHARING EXPERTISE

MAY 2020

Clinical Nutrition in critically ill COVID-19 patients caused by new coronavirus SARS-CoV-2

SUMMARY

- ASPEN and ESPEN call for action: do not forget nutrition therapy in patients with COVID-19.[9, 10]
- Nutritional status of each infected patient should be evaluated.[8]
- All guidelines and recommendations available, regarding Clinical Nutrition in critically ill patients also apply for severely ill COVID-19 patients.[11]
- Provide sufficient calories – enteral: 27 – 30 kcal/kg/d; parenteral (ICU): < 70 % of energy expenditure (EE) in early phase, 80 – 100 % after d3 [11, 12, 13]
- Provide sufficient protein/amino acids – enteral ≥ 1g/kg/d; parenteral (ICU): 1.3 g protein equivalents/d delivered progessively[11, 12]

OBJECTIVE

Fighting coronavirus SARS-CoV-2 is currently the major task for Healthcare professionals (HCP) all over the world. This fact sheet is giving a brief overview of the nutritional support needed during the treatment of severe ill COVID-19 patients.

GENERAL INFORMATION ABOUT THE IMPACT OF THE NUTRITIONAL STATUS ON ELDERLY AND CRITICALLY ILL PATIENTS

Prevalence of malnutrition in hospitalized patients is generally high, especially in elderly people (Fig. 1). More than 55 % of the geriatric patients in hospitals are malnourished.[1] A retrospective observational study in 6,518 adult critically ill patients has shown, that the survival of patients treated in medical and surgical intensive care units is connected to malnutrition.[2] In critically ill patients, malnutrition is independently associated with an increased risk of 28-day mortality.[3]

Nutritional adequacy with respect to the compliance of provided to prescribed calories matters! In critically ill patients requiring prolonged mechanically ventilation, the positive association between nutritional adequacy and long-term outcome has been confirmed. Patients receiving > 80 % of their prescribed target energy have shown a significantly (after adjusting for covariates*) lower 6-month mortality, compared to patients receiving between 50-80 % (adjusted HR 1.3 (0.7 - 2.3)**) or compared to patients receiving only between 0-50 % (1.7 (1.1 - 2.6)) of their energy target[4] (Fig. 2).

In respect to protein requirements a time-dependent association of protein intake and mortality was found. Ventilated patients show the lowest 6-month mortality when increasing protein intake from low (<0.8 g / kg / day) on day 1 - 2 to intermediate (0.8 - 1.2 g / kg / day) on day 3 - 5 and high (>1.2 g / kg / day) after day 5. Overall higher (> 0.8 g protein / day) or overall lower protein provision (< 0.8 g protein / day) results in lower survival rates.[5]

FIG. 1 | Malnutrition in hospitals – association with age[1]

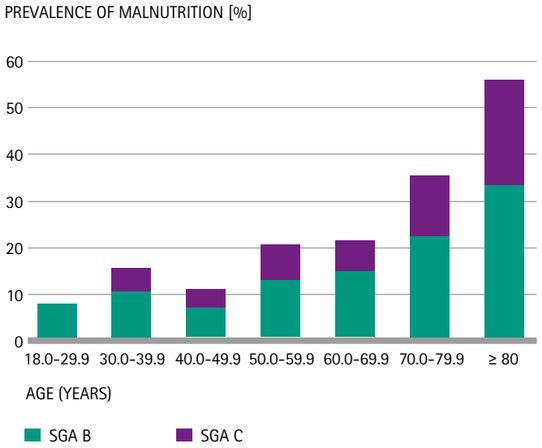

FIG. 1 | SGA B, moderate malnutrition; SGA C, severe malnutrition. The total number of patients in the different age groups were: 18-29.9 years, n=102; 30-39.9 years, n=123; 40-49.9 years, n=232; 50-59.9 years, n=320; 60-69.9 years, n=412; 70-79.9 years, n=385; ≥80 years, n=312.

FIG. 2 | Association of nutritional adequacy* and long-term outcome in ventilated patients**

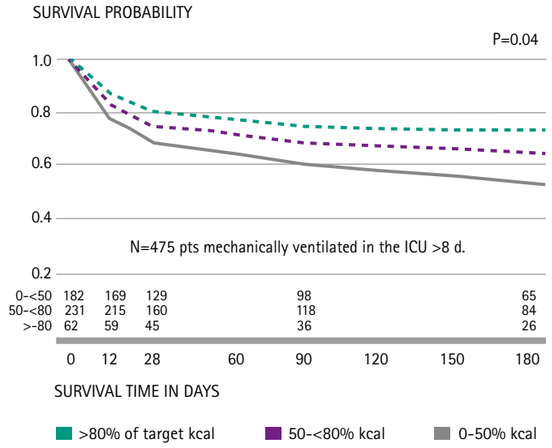

FIG. 2 | The Association Between Nutritional Adequacy and Long-Term Outcomes in Critically Ill Patients Requiring Prolonged Mechanical Ventilation: A Multicenter Cohort Study.[4]

SPECIAL INFORMATION REGARDING COVID-19

The mortality of critically ill patients with SARS-CoV-2 pneumonia is considerable. The survival time of the non-survivors is likely to be within 1 - 2 weeks after ICU admission. Older patients (>65 years) with comorbidities and Acute Respiratory Distress Syndrom (ARDS) are at increased risk of death.[6]

The clinical course and the risk factors for mortality of adult patients with COVID-19 was investigated in Wuhan, China. Beside other factors, Albumin plasma concentration (in g / l) on admission, as a marker for protein synthesis, has been found to be very low**** (29.1 (26.5 - 31.3) *****) in non-survivors (n = 54) compared to survivors (33.6 (30.6–36.4); n = 137); p < 0,0001.[7]

In the absence of direct treatments for the COVID-19 virus, general treatments, coronavirus-specific treatment as well as antiviral treatments should be used. **Nutritional status should be evaluated before starting of the general treatments.**[8]

The need for adequate nutritional support for COVID-19 patients is now also highlighted by different nutrition societies. ASPEN (American Society of Parenteral and Enteral Nutrition) is reminding all clinicians taking care for patients with coronavirus, that nutrition care is vital, particularly in patients with infections.[9]

ESPEN (European Society of Parenteral and Enteral Nutrition) is highlighting on their website that of course, saving lives from acute complications is the first goal in the treatment of COVID-19. Nevertheless, nutritional status and nutritional care plays a very relevant role in defining both short- and long-term outcomes of these patients. In the growing COVID-19 patient population, the older, frail and comorbid individuals are those more at the risk for negative outcome and risks arising from related malnutrition. For the nutritional treatment of COVID-19 patients, ESPEN refers to the respective ESPEN guidelines for ICU, polymorbid, geriatrics and home care.[10, 11]

SPECIAL INFORMATION FROM ESPEN AND PRACTICAL GUIDANCE FOR NUTRITIONAL MANAGEMENT OF INDIVIDUALS WITH SARS-COV-2 INFECTION[11]

Recently, the ESPEN published their "ESPEN EXPERT STATEMENTS AND PRACTICAL GUIDANCE FOR NUTRITIONAL MANAGEMENT OF INDIVIDUALS WITH SARS-CoV-2 INFECTIONS"[11].

In this document, the society is providing a detailed guidance for nutritional management in COVID-19 patients by proposing 10 practical recommendations.

As there are currently no specific studies on the nutritional management in COVID-19 infection, the following ESPEN considerations are based on the best of knowledge and clinical experience at present.

DO NOT FORGET NUTRITION THERAPY IN PATIENTS WITH COVID-19.

*Adjusted for age, APACHE II, Charlston Comorbidity Score, organ failure; **95 % Confidence interval; ***Total intake from EN, PN and propofol Ø 1,800 kcal prescribed (~ 25 kcal / kg); ****Normal range 35 – 50 g / l; *****Given as median (inter quartile range).

ESPEN EXPERT CONSIDERATIONS FOR THE PREVENTION AND TREATMENT OF MALNUTRITION IN INDIVIDUALS AT RISK OR INFECTED WITH SARS-COV-2 [11]

1. CHECK FOR MALNUTRITION

Patients at risk for worst outcomes and higher mortality following infection with SARS-CoV-2, namely older adults and polymorbid individuals, should be checked using the MUST criteria or, for hospitalized patients, the NRS-2002 criteria.

For the MUST criteria please refer to: https://www.bapen.org.uk/screening-and-must/must-calculator

For the NRS-2002 please refer to: https://www.mdcalc.com/nutrition-risk-screening-2002-nrs-2002

The identification of at risk or presence of malnutrition should be an early step in general assessment of all patients, especially including older adults and individuals suffering from chronic and acute disease conditions.

2. OPTIMIZATION OF THE NUTRITIONAL STATUS

Subjects with malnutrition should undergo diet counseling from an experienced professional. Target is to optimize their nutritional status.

Energy needs: can be assessed by indirect calorimetry (IC) when available (ensured sterility of the measurement system) or by predictive equations:

1. 27 kcal/kg body weight (b.w.)/d; total energy expenditure for polymorbid patients aged >65 years[11, 12].
2. 30 kcal/kg b.w./d; total energy expenditure for severely underweight polymorbid patients; target should be reached cautiously and slowly due to high risk of refeeding syndrom in these patients[11, 12].
3. 30 kcal/kg/d as guiding value for older persons, individually adjusted with regards to nutritional status, physical activity[11, 13].

Protein needs:

1. 1 g protein /kg/d in older persons; individually adjusted with regard to nutritional status, physical activity level, disease status and tolerance[11, 13]
2. ≥ 1 g protein/kg/d in polymorbid medical inpatients; to prevent body weight loss, reduce the risk of complications and hospital readmission and improve functional outcome[11, 12].

Fat and carbohydrates: adapted to energy needs, fat-to-carbohydrate energy ratio 30:70 (no respitatory deficiency) to 50:50 (ventilated patients) percent.

3. SUPPLEMENTATION WITH VITAMINS AND MINERALS

Subjects with malnutrition should ensure supplementation with vitamin A, vitamin D and other micronutrients.

As part of the general nutritional approach for viral infections prevention is supplementation and/or adequate provision of vitamins to potentially reduce disease negative impact[8, 11].

In general, low levels or intakes of micronutrients such as vitamins A, E, B6 and B12, Zn and Se have been associated with adverse clinical outcomes during viral infections[11, 14]. This notion has been confirmed in a recent review from Lei Zhang and Yunhui Liu[8] who proposed that besides vitamins A and D also B vitamins, vitamin C, omega-3 polyunsaturated fatty acids, as well as selenium, zinc and iron should be considered in the assessment of micronutrients in COVID-19 patients[8, 11].

ESPEN experts thus suggest to ensure the provision of daily allowances for vitamins and trace elements to malnourished patients at risk for or with COVID-19, aimed at maximizing general anti-infection nutritional defense.

4. REGULAR PHYSICAL ACTIVITY

Patients in quarantine should continue regular physical activity while taking precautions.

Prolonged home stay may lead to increased sedentary behaviors, such as spending excessive amounts of time sitting, reclining, or lying down for screening activities (playing games, watching television, using mobile devices); reducing regular physical activity and hence lower energy expenditure. Thus quarantine can lead to an increased risk for and potential worsening of chronic health conditions, weight gain, loss of skeletal muscle mass and strength and possibly also loss of immune competence.

There is a strong rationale for continuing physical activity at home to stay healthy and maintain immune system function in the current precarious environment[11, 15].

Every day >30 min or every second day >1h exercise is recommended to maintain fitness, mental health, muscle mass and thus energy expenditure and body composition.

5. ORAL NUTRITIONAL SUPPLEMENTS (ONS)

ONS should be used whenever possible to meet patient's needs, when dietary counseling and food fortification are not sufficient to increase dietary intake and reach nutritional goals.

ONS shall provide at least 400 kcal/day including 30 g or more of protein/day and shall be continued for at least one month. Efficacy and expected benefit of ONS shall be assessed once a month.

6. ENTERAL NUTRITION (EN)

In patients, whose nutritional requirements cannot be met orally, EN should be administered. Parenteral nutrition (PN) should be considered when EN is not indicated or unsufficient.

EN may be superior to PN, because of a lower risk of infectious and non-infectious complications[11, 12, 13].

There are no limitations to the use of enteral or parenteral nutrition based on patient age or diagnosis, in the presence of expectable benefit to improve nutritional status.

INDIVIDUALS AT RISK OR INFECTED WITH SARS-COV-2

7. MEDICAL NUTRITION IN NON-INTUBATED ICU PATIENTS

If the energy target is not reached with an oral diet, ONS should be considered first and then EN treatment. If there are limitations for the enteral route it could be advised to prescribe peripheral PN in the population not reaching energy-protein target by oral or enteral nutrition.

Overlooking administration of adequate calorie-protein may result in worsening of nutritional status with malnutrition and related complications. Adequate assessment of nutrient intake is recommended with treatment with oral nutrition supplements or with enteral nutrition if oral route is insufficient.

8. MEDICAL NUTRITION IN INTUBATED ICU PATIENTS I

EN should be started through a nasogastric tube; post-pyloric feeding should be performed in patients with gastric intolerance after prokinetic treatment or in patients at high-risk for aspiration.

Energy requirements: Patient energy expenditure (EE) should be determined by using indirect calorimetry when available. If calorimetry is not available, VO2 (oxygen consumption) from pulmonary arterial catheter or VCO2 (carbon dioxide production) derived from the ventilator will give a better evaluation on EE than predictive equations[11, 16].

Energy administration: hypocaloric nutrition, not exceeding 70% of EE should be administered in the early phase of acute illness with increments up to 80–100% after day 3. If predictive equations are used to estimate the energy need, hypocaloric nutrition < 70% estimated needs should be preferred over isocaloric nutrition for the first week of ICU stay.

Protein requirements: During critical illness, 1.3 g/kg protein equivalents per day can be delivered progressively. Obese patients: in the absence of body composition measurements 1.3 g/kg "adjusted body weight" protein equivalents per day is recommended. Adjusted body weight is calculated as ideal body weight + (actual body weight – ideal body weight) * 0.33[15].

9. MEDICAL NUTRITION IN INTUBATED ICU PATIENTS II

In ICU patients who do not tolerate full dose EN during the first week, initiating parenteral nutrition (PN) should be weighed on a case-by-case basis.

Limitations and precautions: Progression to full nutrition coverage should be performed cautiously in patients requiring mechanical ventilation and stabilization.

Contraindications: EN should be delayed

- in the presence of uncontrolled shock and unmet hemodynamic and tissue perfusion goals;
- in case of uncontrolled life-threatening hypoxemia, hypercapnia or acidosis.

Precautions during the early stabilization period: low dose EN can be started

- as soon as shock is controlled with fluids and vasopressors OR inotropes, while remaining vigilant for signs of bowel ischemia;
- in patients with stable hypoxemia, and compensated or permissive hypercapnia and acidosis.

General comments:

In stablized patients even in prone position, EN can be started ideally after measurement of IC with a target of 30% of measured energy expenditure. Increase energy administration progessively. Emergency times: predictive equation recommending 20 kcal/kg/d can be used, energy increased to 50–70% of the predicted energy at d2 to 80–100% at d4.

The protein target of 1.3 g/kg/day should also be reached by day 3–5.

Gastric tube is preferred but in case of large gastric residual volume (above 500 mL), duodenal tube should be inserted quickly.

Enteral omega-3 fatty acids may improve oxygenation but strong evidence is missing.

If intolerance to EN is present, PN should be considered.

Blood glucose: maintained at target levels between 6-8 mmol/l.

Monitoring of blood triglycerides and electrolytes including phosphate, potassium and magnesium[16].

10. NUTRITION IN ICU PATIENTS WITH DYSPHAGIA

Texture-adapted food can be considered after extubation.

If swallowing is proven unsafe, EN should be administered. In cases with high aspiration risk, postpyloric EN or, if not possible, temporary PN during swallowing training can be performed.

The post-extubation swallowing disorder could be prolonged for up to 21 days mainly in the elderly and after prolonged intubation[11, 17, 18], which makes this complication particularly relevant for COVID-19 patients.

ICU PATIENTS INFECTED WITH SARS-COV-2

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