Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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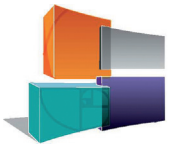

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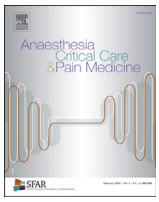

Letter to the Editor

Nutritional support for critically ill patients with COVID-19: New strategy for a new disease?

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Dear Editor,

The severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2) pandemic has been responsible for a massive inflow of mechanically ventilated patients with acute respiratory distress syndrome (ARDS) in our intensive care units. Besides the respiratory condition, the coronavirus disease 19 (COVID-19) is associated with high-nutritional risks in case of ICU admission, due to its pathophysiology and the affected population. Nutritional support in these atypical patients is critical and should be tailored to the patient's prior characteristics before admission and take into consideration the nature and severity of the various organ failures. In these exceptional times, we sought to assess existing recommendations [1–4] to optimise nutritional care for patients suffering from COVID-19 (Fig. 1).

Preliminary data from the territories first affected by the SARS-CoV-2 quickly pointed out that older patients with co-morbidities such as hypertension or diabetes were at risk for severe forms of the disease. In addition to being associated with a worse outcome, this population is known to be affected by a high prevalence of sarcopenia. Moreover, median time between symptoms onset and severe hypoxia requiring ICU admission ranges from 7 to 12 days, during which patients suffer from general (asthenia, fever), digestive (nausea, diarrhea) and otorhinolaryngologic (anosmia) symptoms. These disabling clinical signs associated with an exacerbated systemic inflammatory syndrome may explain the high incidence of dehydration and malnutrition at ICU admission and the necessity to provide early adequate nutritional support.

Existing nutritional assessment such as "Global Leadership Initiative on Malnutrition" (GLIM), "NUTrition Risk In Critically ill" (NUTRIC) or "Nutritional Risk Screening" (NRS) have been validated as pertinent tools associated with the outcome of COVID-19 patients.

Concerning the nutritional support, enteral nutrition (EN) should be preferred to parenteral nutrition (PN) and introduced early after ICU admission in the first 24 to 36 h in the absence of a formal contraindication such as bowel ischemia, active GI bleeding, high flow digestive fistula or abdominal compartment syndrome. Enteral nutrition is feasible in patients requiring prone positioning and/or receiving nerve blocking agents, however, a close monitoring for gastric feeding intolerance is advised, associated with the early use of prokinetics and the elevation of the bed in reverse Trendelenburg position to at least 10 to 25 degrees. Metoclopramide may be the preferable option compared to erythromycin considering the potential cardiac adverse effects of prokinetics when associated with other arrhythmogenic drugs. Systematic measurement of gastric residual volume is not advised as it constitutes a major risk of contamination. A safer alternative to diagnose delayed gastric emptying might be gastric ultrasound, which has proven its effectiveness in the anaesthesia setting; however, evidence is currently lacking.

In case of formal contraindication to EN or severe feeding intolerance, refractory to prokinetic treatment or post-pyloric tube, total parenteral nutrition should be introduced either early in malnourished patients or at day 4–7 in low nutritional risk patients. A sustained attention should be paid to the monitoring of triglycerides, given the high dose of propofol perfusion in COVID-19 patients, and to the provision of vitamins and trace elements.

Progressive implementation of clinical nutrition should be prescribed; starting at 10 kcal/kg/day and reaching 25–30 kcal/kg/day around day-4 or 5. These energy targets must also take into account the calories provided by the propofol infusion i.e. around 1.1 kcal/ml. The use of energy-dense enteral formulas seems relevant in order to facilitate the achievement of the caloric target while restricting the volume of fluid provided and reducing nurse workload (lower number of bag changes). The use of indirect calorimetry may be indicated in prolonged ICU stay (more than 10 days) or with total PN prescription to avoid overfeeding [5].

Progressive protein intake should be prescribed in order to reach 1.2–1.3 g/kg/day at D4 after ICU admission. The target may be raised to 2 g/kg/day in the rehabilitation phase. If a high-protein form is unavailable or out of stock during this critical time of drug shortage, additional parenteral administration of amino-acid solution may be an option.

Regarding obese patients, guidelines recommend the administration of iso-caloric high protein diet and suggest the use of "adjusted body weight" to prescribe caloric and protein intake.

Patients who are initially extremely malnourished or who have not received nutritional intake for more than a week are at high risk of developing a Refeeding syndrome, which can be potentially life-threatening. Expert groups suggest starting, in high risk patients, at 25% of caloric target, regardless of nutrition route, and increasing slowly while closely monitoring serum phosphate,

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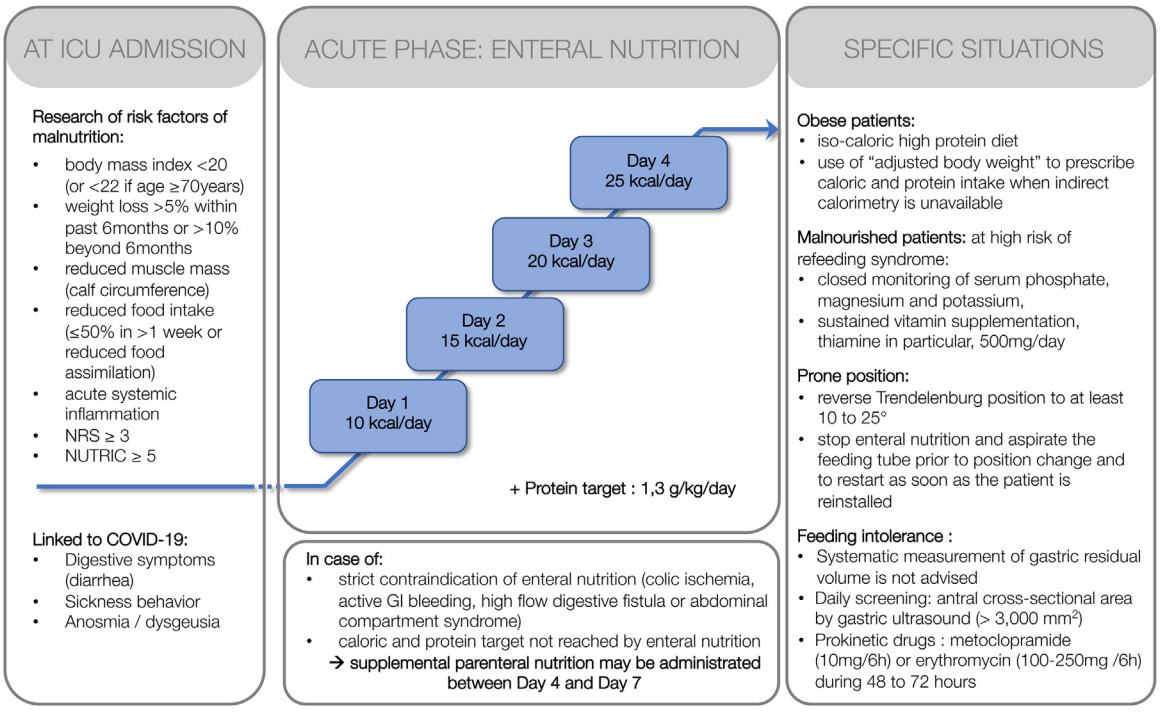

Fig. 1. Schematic overview of the nutritional management of COVID-19 patients in clinical practice. Based on [1–5].

magnesium and potassium, especially during the first 72 h of ICU stay. In case of uncontrollable metabolic disorders, caloric supply should be decreased until normalisation. Sustained vitamin supplementation, thiamine in particular, and provision of electrolytes and trace elements, especially in total PN patients, completes the tailored nutrition care needed by these specific patients.

As with all ICU survivors, and moreover ARDS-survivors, the main challenge for COVID-19 survivors is the implementation of specific multidisciplinary post-ICU rehabilitation care protocols. Collaboration with physiotherapists is essential to provide early mobilisation and physical activity, such as resistance-exercise training, in order to limit or reverse the loss of muscle mass. High protein isocaloric diet introduced during ICU stay should be continued after discharge as long as oral intake is insufficient. Dieticians should be involved in the follow-up of energy intake in the medical wards. Due to prolonged mechanical ventilation, dysphagia and swallowing disorders are frequent. Their incidence should be looked for and monitored.

In conclusion, COVID-19 is a complex disease with a high nutritional risk. The international guidelines issued specifically in this context are clear and offer a pragmatic guidance to all involved healthcare professionals. Considering the lack of knowledge about the medium- and long-term consequences of this new pathology, further research focusing on the rehabilitation and functional outcome of COVID-19 survivors is needed. These data could allow us to adjust our practices in the event of a resurgence during the winter season.

Conflicts of interest

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Authors' contributions

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Emmanuel Pardo[a,*], Jean-Michel Constantin[b], Francis Bonnet[a], Franck Verdonk[a,c]
[a]*Sorbonne University, GRC 29, AP-HP, DMU DREAM, Department of Anaesthesiology and Critical Care, Saint-Antoine Hospital, 75012 Paris, France*
[b]*Sorbonne University, GRC 29, AP-HP, DMU DREAM, Department of Anaesthesiology and Critical Care, Pitié-Salpêtrière Hospital, 75013 Paris, France*
[c]*Department of Anesthesiology, Perioperative and Pain Medicine, Stanford University School of Medicine, Stanford, CA 94305, USA*

*Corresponding author at: Département d'anesthésie-réanimation, Hôpital Saint-Antoine, 184 Rue du Faubourg Saint-Antoine, 75012 Paris, France
E-mail address: emmanuel.pardo@aphp.fr (E. Pardo).

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