Easy-to-prescribe nutrition support in the intensive care in the era of COVID-19

De Watteville, Aude Isabelle; Genton Graf, Laurence; Keli Barcelos, Gleicy; Pugin, Jérôme; Pichard, Claude; Heidegger, Claudia Paula

How to cite

DE WATTEVILLE, Aude Isabelle et al. Easy-to-prescribe nutrition support in the intensive care in the era of COVID-19. In: Clinical nutrition ESPEN, 2020, vol. 39, p. 74–78. doi: 10.1016/j.clnesp.2020.07.015

This publication URL: https://archive-ouverte.unige.ch/unige:159848

Publication DOI: 10.1016/j.clnesp.2020.07.015

Clinical Nutrition ESPEN 39 (2020) 74–78

Contents lists available at ScienceDirect

Clinical Nutrition ESPEN

journal homepage: http://www.clinicalnutritionespen.com

Original article

Easy-to-prescribe nutrition support in the intensive care in the era of COVID-19

Aude de Watteville [a, b], Laurence Genton [a], Gleicy Keli Barcelos [c], Jérôme Pugin [b], Claude Pichard [a], Claudia Paula Heidegger [b, *]

[a] Nutrition Unit, Department of Medicine, Geneva University Hospitals, Switzerland
[b] Division of Intensive Care, Department of Acute Medicine, Geneva University Hospitals, Switzerland
[c] Division of Anesthesiology, Department of Acute Medicine, Geneva University Hospitals, Switzerland

ARTICLE INFO

Article history:
Received 20 July 2020
Accepted 24 July 2020

Keywords:
COVID-19
Nutrition therapy
Critical illness
Pandemic
ICU
Questionnaire

SUMMARY

Background & aims: COVID-19 pandemic had resulted in a massive increase in the number of patients admitted to intensive care units (ICUs). This created significant organizational challenges including numerous non-specialist ICU caregivers who came to work in the ICU. In this context, pragmatic protocols were essential to simplify nutritional care. We aimed at providing a simple and easy-to-prescribe nutritional protocol and evaluated its usefulness with questionnaires sent to physicians involved in the care of ICU COVID-19 patients.

Methods: A simplified nutrition protocol was distributed to all physicians (n = 122) of the ICU medical team during COVID-19 pandemic. Clinical dieticians estimated energy targets for acute and post-acute phases at patient's admission and suggested adaptations of nutrition therapy. More complex situations were discussed with clinical nutrition doctors and, if required, a clinical evaluation was performed. To further facilitate the procedure, a chart with prescription aids was also distributed to the whole medical ICU team. At the end of the current pandemic wave, a 13-item questionnaire was emailed to the ICU medical team to obtain their opinion on the suggested nutritional therapy.

Results: Answers were received from 81/122 medical doctors (MDs) (66% response rate), from intensive care physicians (41%), anaesthesiologists (53%) and MDs from other specialties (6%). Thirty-two percent of MDs felt that their knowledge of nutrition management was insufficient and 45% of the physicians surveyed did not face nutrition management in their daily practice prior to the pandemic. The initially proposed nutritional protocol, the chart with prescription aids and the suggested nutritional proposals were considered as useful to very useful by the majority of physicians surveyed (89.9, 90.7 and 92.1% respectively). The protocol was followed by 92% of MDs, and almost all participants (95%) were convinced that adaptations of nutritional therapy had beneficial effects on patients' outcomes.

Conclusions: Nutritional therapy in critically ill COVID-19 patients is a challenge and the implementation of this specific pandemic simplified nutritional protocol was assessed as useful by a great majority of physicians. Pragmatic and simplified protocols are useful for ensuring the quality of nutritional therapy and could be used in future studies to assess its actual impact on the clinical outcomes of COVID-19 patients.

1. Introduction

COVID-19 pandemic led to a massive increase in the number of hospitalized patients in intensive care units (ICUs) worldwide with serious complications, such as acute respiratory distress syndrome (ARDS), deep vein thromboses, pulmonary embolism, superinfections, septic shock, and acute renal failure [1,2]. This created significant organizational challenges in resource management with an increased need for intensive care beds, number of physicians and caregivers as well as therapies, drugs and equipment [3].

Abbreviations: ARDS, Acute respiratory distress syndrome; BMI, Body mass index; BW, Body weight; IC, Indirect calorimetry; ICU, Intensive care unit; EN, Enteral nutrition; ESPEN, European society for clinical nutrition and metabolism; PN, Parenteral nutrition; SD, Standard deviation; SPN, Supplemental parenteral nutrition.

* Corresponding author. Department of Acute Medicine (DMA), Division of Intensive Care, Geneva University Hospitals (HUG), Switzerland. Fax: +41 0 22 372 74 70.
E-mail address: claudia.heidegger@hcuge.ch (C.P. Heidegger).

https://doi.org/10.1016/j.clnesp.2020.07.015
2405-4577/

In the Geneva ICU, the wave of COVID-19 patients started on March 9, peaked on March 29 and decreased progressively until the end of May. In total, 140 patients were admitted during this period, first to the original ICU, which was extended to the postoperative units and the operating rooms.

Given the rapid increase in COVID-19 patients in the ICU, non-intensive care physicians were rapidly recruited. The ICU staff was more than doubled, mainly with physicians and nurses from the division of anesthesia, but also from the division of surgery and internal medicine. Under these exceptional conditions, easy-to-follow protocols were created in various aspects of specific intensive care, including management of nutritional therapy.

The nutritional support for critically ill COVID-19 patients can be very complex due to pre-existing comorbidities (obesity, diabetes, cardiovascular and respiratory diseases, immunosuppressive therapies, etc.). Most of these patients developed SARS-CoV2 pneumonia with acute lung injury or ARDS and required mechanical ventilation including prone positioning with long-term sedation and muscle relaxant therapy [4–6]. This led to a long weaning process and a prolonged length of stay in the ICU, frequently more than 2 weeks. Critical illness induces a hyper-catabolic state [7,8] which seems even more pronounced in COVID-19 patients because of their severe pro-inflammatory condition. Moreover, underfeeding as well as over-feeding during the ICU stay also contributes to an increased rate of complications with a higher post-ICU morbi-mortality [9–12]. The European society for clinical nutrition and metabolism (ESPEN) has recently published specific guidelines for nutrition management in the context of COVID-19 [13]. However, these guidelines are fairly long to read and difficult to apply in clinical practice due to work overload and limited trained manpower.

Aiming to have the simplest and most pragmatic approach, we collaborated between nutritionist and intensivist physicians and dietitians to provide an easy-to-prescribe protocol for optimized nutrition management. This paper aimed at: 1) presenting the COVID-19 nutrition therapy management elaborated for the adult ICU of the Geneva University Hospitals; 2) assessing the usefulness of this nutritional protocol for the physicians involved in management of COVID-19 ICU patients and their satisfaction.

To our knowledge, this is the first study to present a pragmatic and simplified nutrition management protocol for critically ill COVID-19 patients, and evaluating the opinion of the intensive care medical team regarding its usefulness in this specific pandemic context.

2. Material and method

2.1. Setting

The mixed medical-surgical adult ICU of the Geneva University Hospitals is a 30-bed facility caring for about 2200 patients yearly. During COVID-19 pandemic, the number of beds in the adult ICU was initially increased to 80 then to 120 beds with a total of 122 physicians involved in critically ill COVID-19 patients' care.

2.2. Description of the proposed nutrition management and rationale

The 2019 ESPEN guidelines on clinical nutrition propose to adapt nutritional therapy according to three different phases of the critical illness, the acute phase - early period (day 1–2), the acute phase - late period (day 3–7) and the late phase (from day 8) [14]. To simplify this concept the energy target in our protocol (Fig. 1) was determined according to two main phases: the acute and post-acute phase. The acute phase describes a period of significant stress with hemodynamic and metabolic instability and strong increase of catabolism with the use of endogenous energy. During the post-acute phase, there is a persistent inflammatory state with metabolic instability, or a regression of the inflammatory parameters with progressive anabolism.

Due to the lack of resources and the high risk of contagion, indirect calorimetry (IC) measurements were not used to measure patients' energy expenditure. Energy targets were estimated as 20 kcal/kg of body weight (BW) (actual BW if body mass index (BMI) $\leq$25 kg/m^2; ideal BW (BMI = 22.5) if BMI >25 kg/m^2) during the acute phase (day 1–4) and 25 kcal/kg of BW during the post-acute phase (from day 4) [15].

Based on the current ESPEN guidelines for COVID-19 and ICU patients [13,14], we adapted the nutritional care to the COVID-19 pandemic context as follows: Early enteral feeding from day 1 after admission to ICU was recommended, starting with a small volume (250 ml) to minimize the risk of intolerance and then continuing with a gradual increase of 500 ml per day. In case of reduce motility, prokinetic therapy was initiated. In intubated patients, the goal was to cover 80–100% of the estimated energy needs on day 4, and a maximum of 1000 kcal/day by enteral feeding was suggested in non-intubated patients to minimize the risk of aspiration pneumonia. Depending on the clinical situation and prescriber's knowledge on nutrition, different options could then be considered (oral feeding after excluding dysphagia and providing oral nutritional supplements if needed, increase of enteral nutrition (EN), supplementary parenteral nutrition (PN) or exclusive PN in case of a non-functioning digestive tract), with the aim of covering 80–100% of the nutritional needs on day 4.

In parallel with the protocol, the nutritional prescriptions were checked by the dieticians in intensive care three times a week. They evaluated the energy and protein objectives, gastro-intestinal tolerance, electrolytes, doses of Propofol®, and so on depending on the situation. When necessary, an adaptation of the prescription has been proposed.

Complex situations with nutritional problematics were discussed with clinical nutritionists and, if required, a clinical evaluation of these patients was performed. We soon realized that the protocol initially proposed (Fig. 1) was too much time-consuming for physicians in charge of the current situation, so we decided to add a chart with prescription aids based on the ideal BW (Fig. 2). Using this chart, physicians were able to estimate the energy targets in the acute and post-acute phase based on the height of the patient. Furthermore, they could immediately find the volume corresponding to the enteral nutrition solutions most commonly used in the Geneva ICU.

2.3. Questionnaire

Given the qualitative nature of this project, the local ethics committee confirmed that it did not fall within the scope of the law on human research and that there was no need to be submitted to the ethics committee. The questionnaire was created on the secured REDCap™ plateform, and sent by email to all physicians in charge of COVID-19 patients in ICU. All answers were treated anonymously.

The questionnaire included 13 questions divided into 2 sections: *participants' characteristics* and *specific questions*. The four questions about the characteristics included gender, medical specialty, the years of medical experience as well as in the field of intensive care. The other remaining nine specifics questions focused on: general nutritional knowledge; experience with nutrition in daily clinical practice; usefulness of the initial nutritional protocol, and of the chart with prescription aids; usefullness of the suggestions made from dietitians and clinical nutitionists; adherence to protocol

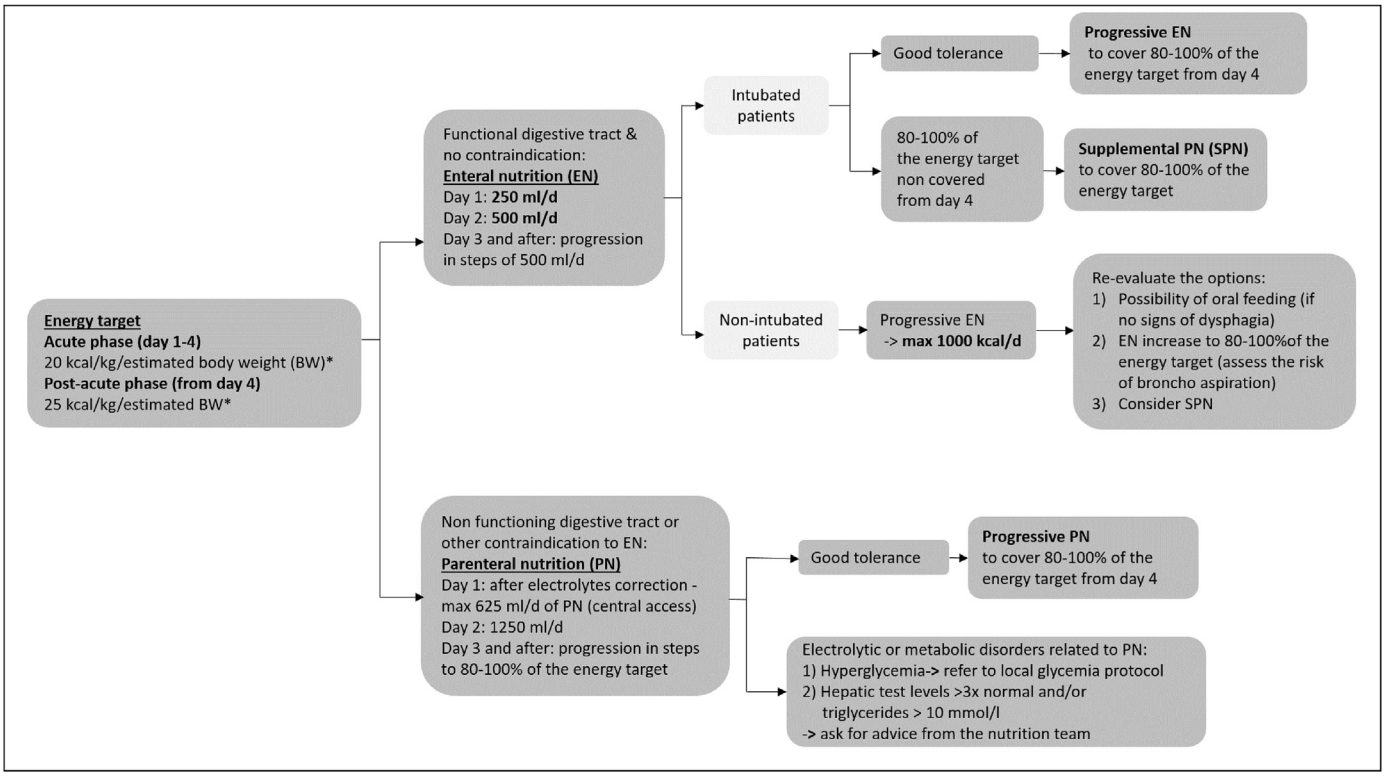

Fig. 1. Nutrition management protocol for critically ill COVID-19 patients.

application; and impact on the suggested protocols on patients' clinical outcomes. Answers were either dichotomous, multiple choice or rating scales. The questionnaire translated from French into English is found in Appendix A.

2.4. Statistical analysis

For rating scale answers, mean scores ± standard deviations (SD) were calculated. Otherwise, number and percentage of

Question
Height ?

Height (cm)	Ideal body weight (kg)	Energy target (kcal)		Enteral nutrition solution (ml)	
		Acute phase (D1-4)	Post-acute phase (from D4)	Acute phase (D1-4)	Post-acute phase (from D4)
145	47.3	950	1200	600	750
150	50.6	1000	1250	650	800
155	54.1	1100	1350	700	850
160	57.6	1150	1450	750	950
165	61.3	1250	1550	800	1000
170	65.0	1300	1650	850	1050
175	68.9	1400	1700	900	1100
180	72.9	1450	1800	950	1200
185	77.0	1550	1950	1000	1250
190	81.2	1600	2050	1050	1300
195	85.6	1700	2150	1100	1400

Increase nutrition progressively in steps from 250 to 500 ml/day until 80-100% of the energy target

Fig. 2. Prescription aids chart - simplified procedure for intubated COVID-19 patients.

Table 1
Participants' characteristics (n = 81).

	N (%)
Sex (women)[a]	33 (41.3)
Medical speciality	
Intensive care medicine	33 (40.7)
Anaesthesiology	43 (53.1)
Others (Internal medicine/Surgery)	5 (6.2)
Years of experiences	mean (SD)
Overall medical experience	10.78 (±7.20)
Intensive care medicine	4.01 (±5.48)

[a] n = 80.

answers in each category were calculated. Participant comments and ideas for improvement were organized and reported in a descriptive way.

3. Results

The questionnaire was sent by e-mail to 122 physicians who were involved in the care of COVID-19 patients, in adult ICU of the Geneva University Hospitals. After four e-mail reminders for 3 weeks, 81 physicians replied (66% response rate). Some questions were not answered by all participants. The total number of responses per question is shown in Tables 1 and 2. Participants' characteristics are described in Table 1.

Sixty-eight percent of the questioned physicians considered having good or sufficient nutrition knowledge, while 32% felt that they lacked it. Forty-five percent were not accustomed to managing nutritional therapy in their daily clinical practice. With regard to nutritional knowledge and the precise management of nutritional therapy, there is a significant difference between doctors in intensive care medicine and other specialities (anaesthesiology, internal medicine and surgery). Indeed, 48% of the ICU doctors considered having good nutrition knowledge compared to 14% of the other categories (Fisher's exact test, p value < 0.001).

Table 2
Specifics questions.

		N (%)
Knowledge regarding nutritional management (n = 77)	*Good*	20 (26.0)
	Sufficient	32 (41.6)
	Lacking	25 (32.5)
Enteral and/or parenteral nutrition management in usual clinical practice (n = 77)	*Yes*	42 (54.5)
	No	35 (45.5)
If yes, frequency of the nutritional management/week (n = 42)	*Everyday*	26 (61.9)
	>3x/week	10 (23.8)
	<3x/week	6 (14.3)
Usefulness of the initially proposed nutritional protocol (Scale from 1 to 4: 4 = very useful; 1 = not useful) (n = 77)	*1*	1 (1.3)
	2	7 (9.1)
	3	41 (53.2)
	4	28 (36.4)
Usefulness of the chart with prescription aids (Scale from 1 to 4: 4 = very useful; 1 = not useful) (n = 75)	*1*	1 (1.3)
	2	6 (8.0)
	3	44 (58.7)
	4	24 (32.0)
Protocol compliance in clinical practice (n = 75)	*Yes*	6 (8.0)
	Rather yes	63 (84.0)
	Rather no	6 (8.0)
	No	0 (0)
Usefulness of the nutrition adaptations proposals (n = 76)	*Yes*	44 (57.9)
	Rather yes	26 (34.2)
	Rather no	6 (7.9)
	No	0 (0)
Positive impact on patients' clinical outcomes (n = 75)	*Yes*	71 (94.7)
	No	4 (5.3)

Nearly all ICU doctors (97%) stated that they were familiar with nutritional therapy compared to 24% of the other specialists (Fisher's exact test, p value < 0.001). The nutritional protocol initially proposed, the chart with prescription aids and the proposals of nutrition adaptations were considered as useful to very useful by a majority of the physicians surveyed. A large majority of participants (92%) followed the proposed protocol. Almost all participants were convinced that the adjustments made may have a positive impact on patients' clinical outcomes. There were no statistical differences between medical specialties in the answers to the specific questions which are shown in Table 2.

What emerges from the general comments as a suggestion for improvement is to enhance the visibility of the proposed nutritional therapy changes.

4. Discussion

This qualitative study shows a good acceptance of a simple and pragmatic nutritional protocol and the perception of usefulness in the context of the challenging ICU environment during the COVID-19 pandemic. This was specially true for non-ICU physicians recruited to cope with the significant workload in ICU. Indeed, 32% of the physicians considered having insufficient knowledge in nutritional therapy, whereas 45% did not use nutritional therapy in their daily clinical practice. The simplified protocol and suggested nutritional adaptations were considered useful. Furthermore, almost all participants estimated that they were compliant to the protocole.

Although ESPEN experts provided comprehensive recommendations for nutrition management, tailored to the context of COVID-19 patients [13], we soon realized that the COVID-19 situation required an urgent adjustment of these ESPEN guidelines [13] into a simple and pragmatic approach. In addition, the recent comments on nutritional support during the SARS-CoV-2 pandemic [16–18] also emphasize on planning pragmatic nutritional interventions to better guide physicians in their clinical practice while maintaining good quality of care.

In this easy-to-prescribe nutritional protocol, we tried to support doctors by adapting the general recommendations of the ESPEN guidelines [13,14] into pragmatic and specific advices, such as guidance for calculation of the energy target; volume (ml) of enteral nutrition per day to be prescribed.

This approach had several purposes: 1) simplification of nutritional management in the context of workload and lack of clinical nutrition expertise for professionals appointed to the ICU medical team; 2) maintenance of the quality of nutritional therapy by avoiding major underfeeding as well as overfeeding; 3) avoidance of the main complications linked to enteral nutrition, i.e. aspiration pneumonia.

In fact, COVID-19 patients often showed poor tolerance to enteral nutrition because of gastrointestinal dysmotility, high gastric residues and paralytic ileus [16]. Finding the right balance between the necessity to match the patient's nutritional needs and avoiding the risks associated with gastrointestinal tolerance remains a major challenge.

Another recent publication also presented a pragmatic approach to nutritional management, but for less severe COVID-19 patients outside of ICU, focusing more on oral feeding [19]. Our pragmatic approach including the protocol, the chart with prescription aids and the advices given was rated as helpful and highly appreciated by the medical team. To our knowledge this is one of the first studies to present a pragmatic simplified nutritional protocol in the context of critically ill COVID-19 patients, only one simplified nutrition management protocol was previously proposed by the Spanish Society of Intensive, Critical Medicine and Coronary Units (SEMICYUC) [20].

This approach has some limitations. The use of predictive formulas based on patients' body weight to determine the energy target is known for poor accuracy [21]. This is especially true for critically ill patients and overweight or obese patients. However, as indirect calorimetry measurements could not be performed, this was the best available option to limit under-as well as over-feeding. It should be noted that enteral nutrition was raised to a maximum of 1000 kcal per day in non-intubated patients to minimize the risk of aspiration pneumonia. In some patients, this could have led to voluntary undernutrition until the nutritional needs could be reassessed. Although essential during this COVID-19 pandemic, a simplified nutrition management protocol could not be perfectly adapted to all patients and situations. Finally, we did not correlate the ICU physician's perception of the nutritional protocol, which was generally good, with the volume of nutrition received by the patients. We are aware that there might be a perception bias.

5. Conclusion

The management of COVID-19 patients has led to new challenges and to a major reorganization of patient care because of the severity and number of patients present in the ICU in the same time span. The implementation of our simplified nutritional support protocol was evaluated as useful by the majority of physicians involved in critically ill COVID-19 patients care. Studies are required to assess outcomes of this simplified approach to nutritional therapy in COVID-19 patients. As new waves of COVID-19 infected patients are likely to occur, availability of pragmatic protocols are needed to ensure the quality of nutrition care.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interest

None declared.

Acknowledgement

The authors wish to thank the entire team of careworkers for their dedication to care critically ill patients during COVID-19 pandemic as well as physicians for their active participation in answering the questionnaire.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.clnesp.2020.07.015.

References

[1] Chen N, Zhou M, Dong X, Qu J, Gong F, Han Y, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020;395(10223):507–13.
[2] Wang Z, Chen X, Lu Y, Chen F, Zhang W. Clinical characteristics and therapeutic procedure for four cases with 2019 novel coronavirus pneumonia receiving combined Chinese and Western medicine treatment. Biosci Trends 2020;14(1):64–8.
[3] Li L, Li R, Wu Z, Yang X, Zhao M, Liu J, et al. Therapeutic strategies for critically ill patients with COVID-19. Ann Intensive Care 2020;10(1):45.
[4] Arentz M, Yim E, Klaff L, Lokhandwala S, Riedo FX, Chong M, et al. Characteristics and outcomes of 21 critically ill patients with COVID-19 in Washington state. JAMA 2020.
[5] Bhatraju PK, Ghassemieh BJ, Nichols M, Kim R, Jerome KR, Nalla AK, et al. Covid-19 in critically ill patients in the seattle region - case series. N Engl J Med 2020;382(21):2012–22.
[6] Grasselli G, Zangrillo A, Zanella A, Antonelli M, Cabrini L, Castelli A, et al. Baseline characteristics and outcomes of 1591 patients infected with SARS-CoV-2 admitted to ICUs of the lombardy region, Italy. JAMA 2020.
[7] Hartl WH, Jauch KW. Metabolic self-destruction in critically ill patients: origins, mechanisms and therapeutic principles. Nutrition 2014;30(3):261–7.
[8] Sharma K, Mogensen KM, Robinson MK. Pathophysiology of critical illness and role of nutrition. Nutr Clin Pract 2019;34(1):12–22.
[9] Ali NA, O'Brien JM, Hoffmann SP, Phillips G, Garland A, Finley JCW, et al. Acquired weakness, handgrip strength, and mortality in critically ill patients. Am J Respir Crit Care Med 2008;178(3):261–8.
[10] Combes A, Costa MA, Trouillet JL, Baudot J, Mokhtari M, Gilbert C, et al. Morbidity, mortality, and quality-of-life outcomes of patients requiring >or=14 days of mechanical ventilation. Crit Care Med 2003;31(5):1373–81.
[11] Wieske L, Dettling-Ihnenfeldt DS, Verhamme C, Nollet F, van Schaik IN, Schultz MJ, et al. Impact of ICU-acquired weakness on post-ICU physical functioning: a follow-up study. Crit Care 2015;19:196.
[12] Puthucheary ZA, Rawal J, McPhail M, Connolly B, Ratnayake G, Chan P, et al. Acute skeletal muscle wasting in critical illness. JAMA 2013;310(15):1591–600.
[13] Barazzoni R, Bischoff SC, Breda J, Wickramasinghe K, Krznaric Z, Nitzan D, et al. ESPEN expert statements and practical guidance for nutritional management of individuals with SARS-CoV-2 infection. Clin Nutr 2020;39:1631–8.
[14] 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(1):48–79.
[15] Heidegger CP, Berger MM, Graf S, Zingg W, Darmon P, Costanza MC, et al. Optimisation of energy provision with supplemental parenteral nutrition in critically ill patients: a randomised controlled clinical trial. Lancet 2013;381(9864):385–93.
[16] Arkin N, Krishnan K, Chang MG, Bittner EA. Nutrition in critically ill patients with COVID-19: challenges and special considerations. Clin Nutr 2020;39:2327–8.
[17] Cintoni M, Rinninella E, Annetta MG, Mele MC. Nutritional management in hospital setting during SARS-CoV-2 pandemic: a real-life experience. Eur J Clin Nutr 2020;74(5):846–7.
[18] Laviano A, Koverech A, Zanetti M. Nutrition support in the time of SARS-CoV-2 (COVID-19). Nutrition 2020:110834.
[19] Caccialanza R, Lavino A, Lobascio F, Montagna E, Bruno R, Ludovisi S, et al. Early nutritional supplementation in non-critically ill patients hospitalized for the 2019 novel coronavirus disease (COVID-19): rationale and feasibility of a shared pragmatic protocol. Nutrition 2020:110835.
[20] Bordejé Laguna L, Lorencio Cárdenas C, González Iglesias C. Algoritmo del tratamiento nutricional en pacientes con COVID-19 del Grupo de Trabajo de Metabolismo y Nutrition de la Sociedad Espanola de Medicina Intensiva. Critica y Unidades Coronarias (*SEMICYUC)* Grupo de Trabajo de Metabolismo y Nutrición de la SEMICYUC.; 2020.
[21] Graf S, Pichard C, Genton L, Oshima T, Heidegger CP. Energy expenditure in mechanically ventilated patients: the weight of body weight! Clin Nutr 2017;36(1):224–8.