Nutritional assessment of severely ill patient

Avaliação nutricional em pacientes graves

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ABSTRACT

Considering the importance and difficulties inherent to assessment of the nutritional state, as well as interpretation of results and inexistence of specific and validated guidelines related to methods practiced with the critically ill patient, the present review aims to contribute to the analysis and recommendation of efficient methods, suitable for use and reliable in terms of interpretation in the context of the critically ill patient. The presence of edema and unspecific alterations in the plasmatic concentrations of proteins; altered anthropometric variables reflecting more the rearrangement of the total body water than changes of the nutritional state; inconclusive electric bioimpedance studies; absence of data related to application of the global subjective assessment to critically ill patients; altered biochemical markers as consequence of metabolic changes that, among others, indicate several limitations of the method for these patients. Notwithstanding the lack of studies to validate the various methods, recommendations based on clinical evidence, observation and physiopathologic alterations are available. Independent from the methods, clinical observation by the health staff at all stages is mandatory. It is crucial to dedicate more efforts to the identification of methods and their specificity for detection, risk assessment or monitoring.

Keywords: Intensive care; Critical care; Nutrition assessment; Nutritional status; Nutritional support; Patient care

INTRODUCTION

Evaluation of the nutritional state is a wide ranging subject. For clinical significance, methods applied must include accuracy, precision, specificity to the nutritional state and sensitivity towards its changes. Further they must be of easy applicability and reproducibility. Unfortunately such an indicator does not exist in an isolated form.[1]

In the critically ill, who cover a large variety of patients with different diseases, metabolic responses and treatments, malnutrition may be preexistent, manifest itself upon admission or develop as a result of the hypercatabolic and hypermetabolic state. Prevalence of malnutrition varies from 30% to 60% of hospitalized patients and is higher in these patients due to alteration in the metabolism of different substrata and to nutrient deficit.[2-4]

Nutritional evaluation of the critically ill patient aims to estimate risk of mortality and morbidity of malnutrition, by identifying and singling out causes and consequences, with a more precise indication and intervention of patients who can most benefit from nutritional support. Follow-up and monitoring of the efficacy of nutritional therapeutic is further assumed.[2]

There are different parameters to evaluate the nutritional state. However, their use for the critically ill is problematic, due to interference by acute disease or by the therapeutic measures on the results that affect their interpretation.[5] In general, methods habitually used for other patients are those elected to evaluate the nutritional state of the critical patient[2], although limitations in the application, as well as interpretation of results, hinder this very important practice.[5]

In view of the importance and difficulties intrinsic to the assessment of the of the critical patient's nutritional state, as well as to interpretation of results, accrued by the few studies on usefulness of the more routinely used parameters, such as anthropometric parameters or biochemical indicators applied to the critically ill patients, this study intended to contribute to the analysis and recommendation of efficient and reliable methods related to interpretation in the context of the critical patient, considering this patient's specificity.

The study comprised a bibliographic review based on qualitative analysis of the references found in the PubMed *(National Library of Medicine and National Institute of Health – USA),* MedLine*, Academic Search Premie* and SciElo as well as the collection of the Mário Osório Marques library (UNIJUÍ, Ijuí, RS). Search strategy was defined by key words regarding the critically ill patient (critical patient, severely ill patients, terminal patient, intensive care) in combination with terms related to assessment of the nutritional state (assessment and nutritional state, nutritional assessment methods, hospital malnutrition). Only information regarding adult patients was used.

ENDOCRINE, METABOLIC AND NUTRITIONAL CHANGES OF THE CRITICALLY ILL PATIENT

The severe or critical disease relates to a wide variety of clinical or surgical conditions that are life threatening and in most cases require admission to the intensive care unit (ICU).[6] Although the setting includes patients with many diseases, often with quite different metabolic responses, jeopardizing overall recommendations for all patients[7], frequently at least one severe systemic dysfunction is described, requiring active therapeutic support. Sepsis or systemic inflammatory response syndrome to infection is found in a substantial number of cases and consists of the systemic inflammatory response as a result of endogenous mediators such as hormones, cytokines, coagulation factors and eicosanoids, among others.[6]

The most important changes include hypermetabolism, hyperglycemia with insulin resistance, accentuated lipolysis and increased protein catabolism.[8-9] Impact of the combination of these metabolic changes and absence of nutritional support may lead to rapid and severe depletion of lean body mass. Nutrition cannot prevent or totally revert these alterations, playing a role of support in opposition to a therapeutic role, however being capable of retarding the process of protein catabolism.[6] Initial proteolysis of the skeletal muscle can be followed by erosion of the visceral elements and circulating proteins. The resulting protein malnutrition associated to hepatic, cardiac, pulmonary, gastrointestinal and immunologic dysfunction may bring about multiple organ failure.[10]

Effects of malnutrition on the evolution of hospitalized patients are reported as coadjuvant factors of mortality and morbidity.[11] Various studies point out that loss of lean mass increases risk of infection, reduces cicatrisation and increases mortality. When this loss reaches 40% it is, in general, lethal.[12]

Although the patient usually presents with some degree of malnutrition upon admission, as the outcome of various factors there is a worsening of the nutritional state during the admission period.[11] This process is more frequent for patients admitted at the ICU, because they usually evolve to a condition of hypermetabolism with decrease of immunity associated to the clinical evolution.[5,13-14] This increases nutritional requirements at a time, when it is often difficult to meet them, either due to problems inherent to use of more physiological nutrition or because of rapid evolution of the hypermetabolic condition.

METHODS FOR ASSESSMENT OF THE NUTRITIONAL STATE

Considering the higher risk shown in clinical practice by malnourished patients[15], an early nutritional assessment is required to achieve different diagnoses of malnutrition levels and identify patients in need of nutritional therapy[16], thereby permitting adequate intervention to aid recovery or maintenance of the patient's health condition.[17] It is also noteworthy that various nutritional indicators must be used for a reliable nutritional diagnosis.[5]

The physical exam and anthropometry supply important information when evaluating the nutritional state of a patient. Interview and physical examination offer a contact with the patient that cannot be reproduced in the numbers of laboratory tests. The physical exam carried out in a systematic and progressive way aims to determine the patient's nutritional condition and it is advisable to perform it weekly. The physical type, mobility and signs of nutritional depletion (decrease of muscle and subcutaneous tissue and weight loss) are observed. Skin must be observed for pigmentation, abnormal coloring, contusions, lesions and edema, presence of pressure sores and turgor. Nails must be examined as for their shape and outline, angle and presence of injuries. Color of the tongue, cracks, cuts, humidity, texture and symmetry can also be assessed. The patient' ability to eat and hold eating utensils must also be assessed.[18]

In anthropometry, body mass, which is the sum of all body components, may be used as it reflects the Individual's protein - energy balance. The body mass index (BMI) is another simple indicator of the nutritional state. Although values between 18.5 and 24.9 kg/m^2,[19] considered eutrophic, less than 20 kg/m^2 are indicative of malnutrition and associated to a significant increase of mortality in different types of patients.[20] An unintentional loss of body mass greater than 10% in the last six months or a more rapid loss are prognostic of clinical evolution[21] and classical signs of malnutrition.[2] However, it may be difficult to determine the real loss of body mass in sick individuals, because of poor accuracy.[22]

Among other anthropometric variables, the most useful are the arm muscle circumference (AMC) that evaluates the arm muscle tissue reserve (with no correction of the bone area) reached by the values of arm circumference (AC) and the triceps skinfold thickness (TST).[5,17]

Measurement of the *adductor pollicis* muscle thickness (APM), an important parameter used by Andrade et al.[22] at pre-operative of cardiac surgery is a prognostic indicator for clinical patients, and is associated to evolution of sepsis and non-sepsis complications, mortality and length of hospital stay.[24]

Bioimpedance assesses the volume of body fluids by measuring resistance to a high frequency, low amplitude alternating electric current (50 kHz a 500 - 800 mA).[21]

Resistance is inversely proportional to the volume of electrolytic fluids in the body. By establishing the whole body water, the fat free mass and the fat percentage may be estimated. Application and validity of the method, for hospitalized patients has not been fully studied for all clinical situations. Limitations of the method are primarily related to factors that alter the hydration state. In patients with an altered body fluid distribution (heart, liver and kidney conditions) bioimpedance is not indicated to assess the nutritional state, but useful for the follow-up of its evolution.[25]

Initially proposed by Detsky et al.,[26] for surgical and oncologic patients, the Subjective Global Assessment (SGA) is a simple, low cost method that can be carried out in a few minutes at the bedside.[27] It is based on the clinical and dietary history also physical exam. Food intake in relation to the patient's usual standard, decrease of body mass in the last six months, alteration in dietary intake, presence of gastrointestinal symptoms and functional capacity related to the nutritional state are assessed. Furthermore, it evaluates metabolic requirement, according to diagnosis and loss of subcutaneous and muscle fat and presence of edema resulting from malnutrition and ascites.[2,5,15,17,27]. SGA is not only a diagnostic tool, but also identifies risk of complications associated to the nutritional state during hospital stay. One of the disadvantages of this method is that for diagnostic precision it relies on the experience of the observer and because of lack of quantitative criteria use for monitoring the patient's evolution is jeopardized.[27]

Biochemical indicators help to assess the nutritional state, supplying objective measurements of these alterations, with the advantage of allowing follow-up over time and nutritional interventions.[2] Decrease of serum concentrations of essentially hepatic synthesis proteins may be a good indicator of protein-energy malnutrition. However, it is important to note that there are many factors, besides the nutritional, that may modify the concentration of serum proteins (variations in the hydration state, hepatopathies, increased catabolism, infection or inflammation) so the method should not be used exclusively for nutritional diagnosis.[17]

Among the biochemical variables indicating the state of visceral proteins are:

- Albumin – most frequent biochemical parameter of nutritional assessment. Various studies correlate low serum album concentrations, with higher incidence of clinical complications, mortality and morbidity. However, understanding albumin physiology may explain why its concentration correlates with disease severity, but alone it may not be an appropriate measurement of the nutritional state.[21]
- Prealbumin – synthesized in the liver and partially catabolized in the kidneys decreases in energy-protein malnutrition and is restored to normal levels upon nutritional repletion. However, it also decreases in conditions not related to the nutritional state, such as infection and hepatic failure, as well as in response to cytokines and hormones and increases in renal failure. Although it responds to nutritional therapy, with a short mean life of two days, it constitutes one of the parameters more sensitive to nutritional changes. Because it is also influenced by factors related to disease, it becomes an unreliable index of the diseased individuals' nutritional states.[5,21]
- Transferrin – beta-globulin , mainly from the

hepatic synthesis whose principal function is iron transport, with a mean life of 8 days, transferrin presents low sensitivity and specificity when analyzed individually and its levels are increased in iron deficiency anemia and decreased in liver diseases, sepsis, malabsorption and inflammatory alterations.[5]

- Retinol carrier protein – its short mean life of 12 hours makes it an indicator of nutritional follow-up. Its level increases with intake of vitamin A, decreases in hepatic disease, infection and severe stress. It is not useful to assess renal patients from a nutritional standpoint.[5]
- Somatomedin C or Insulin-like Grow factor (IGF) - low molecular weight peptide, mediator of the growth hormone action, somatomedin C or IGF-1 has been used to assess the intensity of metabolic response to aggression and is a good parameter for nutritional follow-up. Cost and complexity for determination, restrict its use. [5] As well as with other plasmatic proteins, its use is limited by decrease during the acute stages of inflammatory diseases.[28]

Other proteins that may be related to metabolic response, but subject to changes in many situations not related to the nutritional state are the protein C alpha-1 trypsin, alpha-1-glycoprotein, fibrinogen and hepatoglobulin.[2]

Among the biochemical variables indicating the state of muscle proteins are:

- Creatinine-height index – during malnutrition and hypercatabolic states, intense degradation of the skeletal muscle may be gauged by dosage of urine creatinine, a metabolite resulting from creatinine hydrolysis, whose synthesis is constant. As such, it assesses muscle catabolism. It discloses nutritional deficiency upon admission, however it has no value for prognosis or follow-up when used alone. Interpretation may be complicated by interfering factors such as age, stress, dietary protein content and renal function.[5,17,28] Further it requires 24- hour urine collection. Failure in collection or oliguria may lead to false interpretation and diagnosis of malnutrition.[21]
- 3-metylhistidine – is a metabolite resulting from muscle protein catabolism. Readings increase in hypercatabolism and decrease in the aged and undernourished. It is a parameter for nutritional follow-up, nutritional recovery and muscle catabolism.[28]
- Urea excretion – is a measurement of protein catabolism. Readings vary in relation to intravasacular volume, nitrogen increase and renal function.[5]
- Nitrogen balance – a noninvasive and accessible technique consisting of the difference between intake and excreted nitrogen, used for metabolic stress assessment. It is a good parameter to assess protein intake and breakdown and therefore repletion of malnourished patients (follow-up and monitoring of treatment).[5,17,28]

Another biochemical parameter is serum cholesterol. When below 160 mg/dL it may indicate malnutrition, although such decrease becomes evident only at a late stage, hampering its use as method for nutritional assessment. Nevertheless, mostly in the aged, cholesterol used as prognostic method shows a relation with increased mortality and length of hospital stay.[28] Low serum levels are also seen in renal and hepatic failure and in malabsorption.[5]

As for immunological competence parameters, decrease in total lymphocyte count (TLC) < 1500 mm^3, the ratio CD3/CD4 (< 50), as well as decrease or absence (anergy) of cell immune response established by late skin hypersensitivity to specific antigens (< 10 mm of induration = moderate depletion; < 5 mm of induration = severe depletion) have been used as nutritional parameters as they may be affected by malnutrition.[5,28]

However they become poor malnutrition predictors, because they are influenced by various diseases and drugs such as infections, uremia, acidosis, cirrhosis, hepatitis, trauma, burns, hemorrhage, steroids, immunodepressants, cimetidine, warfarin, anesthesia and surgery.[21]

Other methods, involving more precise and reliable tests have restricted use due to cost or because they are not very practical, such as tritium dilution or radioisotopes (^{40}K).[29]

For the purpose of predicting risks of morbidity and mortality in the course of severe or surgical disease and for indication of nutritional support[5,28], nutritional prognosis indices are used. Among them may be mentioned the prognostic nutritional index (PNI) by Buzby et al.[30], that assesses serum albumin, tricipital skin-fold, serum transferrin and skin hypersensitivity; the Blackburn[31] prognostic hospital index (PHI), which assesses serum albumin and skin tests; the instant nutritional assessment (INA) by Seltzer et al.[32], that assesses serum albumin and TLC and nutritional assessment (NA) by Cristallo et al[33] who assessed serum albumin and total iron binding capacity or loss of body mass to assess surgical risk for patients with neoplasia.[28,34]

Muscle activity is directly related to cell energy function which is restored by nutritional rehabilitation. Based upon evidence that muscle function constitutes an index of nutritional changes and risks[35], analysis of muscle strength in the active form as well as in the passive has been used. In the active form, strength of the respiratory muscles and apprehension capacity and in the passive, contraction and muscle relaxation response to different electric intensities[2] such as the method developed by Edwards, measuring muscle contraction of the *adductor pollicis* in reaction to an electrical stimulus of the ulnar nerve.[21] .

Another method, seldom used in clinical practice, albeit considered the gold-standard for measuring energy expenditure in healthy individuals and critically ill patients is indirect calorimetry. By measuring oxygen flow, volume and concentration of oxygen and carbon dioxide intake and output, oxygen consumption and carbon dioxide production are measured. Thus, the respiratory quotient may be calculated. To determine basal energy expenditure, the nitrogen excreted in urine is also used. As it is dependent on lean body mass, it is considered an indirect way of assessing nutritional state.[35-37]

Assessment of the nutritional state of the critically ill patient: indications and restrictions

Presence of edema and non-specific changes in plasma protein concentrations often mask the nutritional assessment during critical disease. The pre-morbidity nutritional state, disease severity and clinical predictions of the disease's course may help to identify patients at nutritional risk.[6]

In general, to assess the nutritional state of the critical patient, the same methods as for other patients are used, such as anthropometry, biochemical markers and skin folds. They can be performed as soon as the patient is admitted, but they must be carefully interpreted because they may be affected by changes brought about by acute disease and by treatment.[5] Furthermore, difficulties inherent to some procedures, in view of the patient's overall condition, may limit usefulness of some methods.

Anthropometric variables for assessment of the nutritional state of the critical patient

Anthropometric variables may assess and detect malnutrition preexisting admission of the critical patient.[5] However, in these patients, these variables may be altered because of changes in the hydration state and of hypoalbuminemia thus, decreasing their validity if considered as parameters of follow-up and prognosis.[5,36] Gauging of the body mass in hospitalized patients, in the ICU, patients with hepatic disease, solid tumors and renal failure may be mistaken for changes in the body fluid balance due to hyperhydration, edema, ascites and dyaliosate in the abdomen[20] in addition to use of diuretics and fluid infusion. According to Mourilhe et al.[39], alteration of body mass in these patients is more a reflex of the total body fluid rearrangement than changes of the nutritional state. Implication of involuntary weight losses greater than 10%, acute or in the last six months, indicative of malnutrition in patients in general, has not been assessed in critical patients.[2,5]

The easiest method to calculate the stature of critical patients, a measurement used to calculate energy expenditure by prediction formulas and for the estimate of the BMI is the recumbent stature. Other methods such as arm span and the sternal notch may also be used. However, it may be difficult in the critical patient because of multiple venous accesses obstructing successful measurement. Use of knee height, although easy to obtain is limited because of reports that it is underestimated in relation to the real stature of patients.[39] In the other hand, Mourilhe et al. do not recommend use of the stature reported by family members or those responsible, especially of aged patients, as they may overestimate the real stature of patients who lose from 1 to 2.5 cm each decade.[39]

Skin-fold thickness and arm circumference used respectively to calculate body fat and muscle protein must be used for the critical patient to monitor evolution, without taking into account reference values. On occasion, access to the correct anatomical point for measurement may not be possible due to burns, bandages or venous accesses[1]. According to Acosta Escribano et al. the two most often used, arm muscle circumference and triceps skin fold, are not very useful for the critical patient.[5] Such measurements may not be reliable due to increased body fluid in these patients.[39] On the other hand, thickness of the *adductor pollicis* muscle (APM) is an important parameter, indicator of prognosis in critical patients, associated to evolution to septic and non-septic complications, mortality and length of hospital stay.[24]

According to Daley (1994)[40] anthropometric techniques for nutritional assessment in the acute severe disease have a regular value regarding accuracy and are poor with respect to sensitivity and specificity. Measurements are not necessarily related to the nutritional state and must not be used to assess risk of malnutrition in the critical patient. In the absence of more sensitive tests anthropometry could provide a numerical base to assess response to a long term nutritional treatment.[39]

Other technically more precise methods such as electrical bioimpedance require further testing prior to recommendation for these patients.[2,41] Nevertheless, the potential of developing and using this technique for critical patients is very great. Its convenience makes it an accessible technique. However, before its widespread use for these patients, parameters of normality must be defined and validated.[2,42]

Subjective global assessment

To our knowledge there are no data regarding application of this method in critical patients**.**

Biochemical variables in the nutritional assessment of critical patients

Biochemical markers (creatinine/height index, serum albumin, and others) are also altered as a result of metabolic changes that affect the processes of synthesis and degradation.[2]

Concerning the variables indicative of the state of visceral proteins, proteins of short mean life such as prealbumin and retinol binding protein are not indicative of the nutritional state, even if the report on the response of nutrient intake and on occurrence of new metabolic stress situations, becoming parameters of assessment and follow-up of the critical patient[2]. According to Miranda and De Oliveira[11], dosage of prealbumin and retinol binding protein are the most recommended indicators for assessment of the critical patient. However, because of the high cost, small and medium size hospitals cannot carry out this dosing as often as needed. Albumin levels have a prognostic value upon admission of the critical patient, but are not very sensitive to acute changes of the nutritional state, due to the long mean life. Further, they are not good parameters of nutritional follow-up although their levels can relate to the extension of the injury.[5]

Chronic iron deficiency as well as the many transfusions and intestinal absorption changes invalidate transferrin as a parameter for critical patients.[5]

Regarding the state of muscle proteins in the critical patient, urea excretion is an index of the intensity of metabolic response to stress. Nitrogen balance is a good index for nutritional prognosis, however it is not a valid parameter of malnutrition or of nutritional follow-up. In the critical patient urinary 3 methylhistidine is a parameter for nutritional follow-up, feedback and muscle catabolism. The creatinine/height index detects previous malnutrition, lacking however prognostic and follow-up value. For the critical patient nitrogen balance is not a valid parameter for malnutrition and follow-up, but a good index for nutritional prognosis.[5] In such patients a positive nitrogen balance cannot be attained at the initial stages of the disease, therefore, even with nutritional support, these patients persistently present a negative nitrogen balance during the first days. Yet, at recovery in the case of adequate nutritional support, a positive nitrogen balance may be perceived.[2]

According to Acosta Escribano et al., hypocholesterolemia may be indicative of malnutrition in critical patients and may be related to increased mortality.[5]

Considering parameters with immunological function in the critical patient, TLC as well as immune function tests (CD3/CD4 ratio and cell immunity) may be altered due to the clinical condition or to drugs. However, they are valuable as parameters for the evolution of critical patients with an immune deficit upon admission.[5]

Parameters for functional calculation in the nutritional assessment of the critical patient

The need for methods that do not necessarily require patient cooperation and are not specifically affected by sepsis, drugs, trauma, surgical interventions and anesthesia is a restriction for functional tests, more so in these patients. Although the values are more sensitive and specific for predicting surgical complications than biochemical markers such as albumin and transferrin, in the critical patient muscle function tests may be altered by various factors. Parameters for assessment of the functional capacity are therefore difficult to use and interpret in a large number of critical patients as a result of treatment with drugs that affect muscle function or due to presence of polyneuropathies.[2,21] Specifically electrical stimulation of the *adductor pollicis* muscle was described by Finn et al. and Lagneau et al. as difficult to apply in critical patients, without disclosing significant disorders of this function, suggesting that the method does not significantly reflect the extension of proteinolysis, but only disclosing the energy state of the cell.[43,44]

Indirect calorimetry

Although indirect calorimetry is not a common practice, as it is not available in many hospitals, it can be a useful method to address and optimize a nutritional conduct, especially in critical patients.[34,45] Due to the many factors that interfere in the metabolic rate of these patients, it is one of the safest methods and therefore recommended to establish energy expenditure.[46] When adequately used it minimizes estimation errors of the calorie requirement[36] often overestimated for these patients. This is especially true at the initial and acute stage of the critical disease when excess is associated to worse prognosis.[47] This method should become a reliable tool for monitoring of the critical patient, as the equipment becomes less costly, more compact and easier to operate.[45]

Indices of nutritional prognosis in the critical patient

According to Daley (1994)[40] one of the most used indices is that of Bistrian, validated only for surgical but not for critical patients. Instant nutritional assessment (INA) by Seltzer et al.,[32] is also used for critical patients in intensive care, considering that serum albumin< 3.5 g% and lymphocytes count < 1500 mm^3 are indicative of a high risk of complications.[28]

Other methods

Neutron activation analysis, that measures total body nitrogen and potassium isotopes that calculate lean mass are still experimental techniques, not yet very useful for the critical patient.[5]

Nutritional assessment of the critical patient: general recommendations

Because of lack of studies on the usefulness of anthropometric parameters or of the biochemical markers, more frequent of the nutritional state of critical patients, Acosta Escribano et al.[5] and Gonzáles et al.[2] concluded that their routine use cannot be recommended for assessment of the critical patient, suggesting that they be used as guidelines, specific markers in the different stages of the critical patient's evolution. Upon admission, the weight loss, body mass index, creatinine/height index , serum cholesterol and subjective global assessment are suggested. To assess the effects of nutritional therapy the nitrogen balance, prealbumin, retinal binding protein, serum somatomedine and urine 3 methyl histidine are suggested. For assessment of the metabolic response, are proposed urea excretion, 3 methyl histidine prealbumin, and acute stage proteins. For nutritional follow-up prealbumin, retinol binding protein, somatomedine, serum albumin and muscle function are suggested, while for prognosis albumin and nitrogen balance are elected.

Still according to Gonzáles et al., at the current stage of knowledge, it seems that reliable parameters are not yet available for assessment of the nutritional state of such patients.[2]

SEQUENTIAL NUTRITIONAL ASSESSMENT

Albeit there are a consensus that follow-up of the nutritional state of these patients at all stages of the disease, that is to say hypermetabolism, stabilization and recovery are of fundamental importance[11], there is not yet a full understanding about the nutritional evolution of critically ill patients.

According to Cardoso et al. nutritional screening and risk assessment should be performed in the first 24 hours after admission of critical patients.[48] The screening method chosen should be evaluated for its predictive power, accuracy and inter-observer viability.[2] Beyond methods it is considered fundamentally important that nutritional assessment be frequently repeated to detect incidence of new malnutrition cases and evolution of those previously detected[15] , in view of the greater nutritional risk of hospital stays of two weeks or more.[48]

Ferreira[49] ,quoting guidelines for nutritional support specifically in trauma patients (*Eastern Association for the Surgery and Trauma* (EAST) *Practice Management Guidelines Work Group.* 2001) suggests that after onset of nutritional therapy, plasmatic electrolytes, glucose and magnesium, urea, creatinine, calcium and inorganic phosphorus must be checked daily until stabilization. On the other hand, total proteins, albumin and prealbumin must be monitored weekly until stabilization. After the critical stage a continued monitoring of these biochemical parameters must be performed for follow-up and clinical evolution. Dickerson et al. and Hunter et al. recommend indirect calorimetry to be performed 2 to 3 times a week in critical patients.[50-51]

Notwithstanding consensus on the importance of nutritional assessment in the critical patient and of the inexistence of specific and validated guidelines, there are also no overall recommendations about frequency of assessment of markers of nutritional follow-up especially the biochemical. There is, however, a practice of request on a weekly basis during the length of stay in the ICU.[2]

ROLE OF THE MULTIDISCIPLINARY TEAM IN THE PREVENTION OF MALNUTRITION OF CRITICAL PATIENTS

Because of the complexity of the factors involved in the monitoring of critical patients, work must be carried out by a multidisciplinary team, mainly in the ICU where, notwithstanding all technological advances, patients still present a high incidence of malnutrition.[52] The joint work of specialists with different training permits to integrate, harmonize and complement the knowledge and qualifications of members of the team for identification, intervention and follow-up of therapeutics of nutritional disorders.[53]

While nutritional screening involving use of simple techniques for identification of undernourished or at risk patients, it can be applied by any member of the health team once the patient at risk is identified for assessment and follow-up by the nutrition professional.

It should be further considered that in addition to reduced intake, restricted fluid supply, hemodynamic instability, lesser absorption and drug/nutrients interaction that may be nutritional risk situations, the little attention paid by health professionals to nutritional care leading to inadequate indication, to lack of nutritional assessment and to infrequent monitoring may contribute to malnutrition.

CONCLUSIONS

Since a single parameter does not characterize the nutritional condition of the individual, the association of various indicators must be used to improve precision and accuracy of nutritional diagnosis.

The different limitations of the methods are compounded by the characteristics inherent to critical patients. For lack of broader studies that validate the various methods for this particular patient, there are recommendations based upon some clinical evidence, observation and the basis of physiopathologic changes. Thus, the urgent need for more studies that clearly identify the methods and their specificity for detection, risk assessment or monitoring, is addressed. Limitation to anthropometric methods, for instance, or for their use beyond their interpretation possibilities may lead to diagnostic error, once malnutrition has set in and progressed through a series of functional changes that, in turn precede any alteration in body composition. Therefore, to establish the definition of malnutrition on isolated parameters, supported on any of these modifications is inappropriate. Only by recognizing the diverse aspects of malnutrition and of the critical patient is it possible to define the manifestations of malnutrition.

Notwithstanding the methods utilized, clinical observations developed by the health team form an indispensable parameter for early detection and the action of monitoring.

RESUMO

Considerando a importância e as dificuldades inerentes à avaliação do estado nutricional, assim como da interpretação dos resultados, além da inexistência de diretrizes específicas e validadas quanto aos métodos aplicados ao paciente crítico, o objetivo deste estudo foi contribuir para a análise e recomendação de métodos eficazes, passíveis de utilização e fidedignos do ponto de vista da interpretação no contexto do paciente grave. A presença de edema e alterações inespecíficas nas concentrações plasmáticas de proteínas; variáveis antropométricas alteradas, refletindo muito mais o rearranjo da água corporal total do que modificações do estado nutricional; estudos pouco conclusivos com a bioimpedância elétrica; ausência de dados relativos à aplicação da avaliação subjetiva global; indicadores bioquímicos alterados como conseqüência das mudanças metabólicas, entre outros, indicam as várias limitações dos métodos a esses pacientes. Na ausência de estudos que os validem, existem recomendações baseadas em evidências clínicas, observação e fundamentação nas alterações fisiopatológicas. Independentemente dos métodos, a observação clínica pela equipe de saúde é imprescindível em todas as etapas. Há necessidade de maiores estudos que identifiquem claramente os métodos e sua especificidade para a detecção, avaliação de risco ou monitorização.

Descritores: Cuidados intensivos; Cuidados críticos; Avaliação nutricional; Estado nutricional; Suporte nutricional; Assistência ao paciente

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