

Quality indicators in nutrition therapy within the intensive care setting of a Brazilian teaching hospital

Indicadores de qualidade em terapia nutricional no contexto de cuidados intensivos em um hospital de ensino brasileiro

Indicadores de calidad en terapia nutricional em el contexto de cuidados intensivos em un hospital universitario brasileño

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Abstract: The topic addressed by this study was quality indicators in nutritional therapy. The aim was to evaluate the quality of nutritional therapy in an intensive care unit for adults in a Brazilian university hospital. Ten quality indicators selected from a list prepared by the Clinical Nutrition Task Force of the International Life Sciences Institute (ILSI-Brazil) were applied. It was observed that the use of quality indicators of nutritional therapy allowed the identification of compliance and nonconformity processes, which still need additional adjustments.

Keywords: nutrition therapy; quality indicators, health care; enteral nutrition; parenteral nutrition; quality management.

Resumo: O tema abordado pelo estudo foi indicadores de qualidade em terapia nutricional. O objetivo foi avaliar a qualidade da terapia nutricional em uma unidade de terapia intensiva para adultos em um hospital universitário brasileiro. Realizou-se a aplicação de dez indicadores de qualidade selecionados de uma lista elaborada pela Força Tarefa de Nutrição Clínica do International Life Sciences Institute (ILSI-Brasil). Observou-se que o uso de indicadores de qualidade de terapia nutricional permitiu a identificação de processos em conformidade e em não-conformidade, que ainda precisam de ajustes adicionais.

Palavras-chave: terapia nutricional; indicadores de qualidade em assistência à saúde; nutrição enteral; nutrição parenteral; gestão da qualidade.

Resumen: El tema abordado por el estudio fue indicadores de calidad en la terapia nutricional. El objetivo fue evaluar la calidad de la terapia nutricional en una unidad de cuidados intensivos para adultos en un hospital universitario brasileño. Se aplicaron diez indicadores de calidad seleccionados de una lista preparada por el Grupo de trabajo de nutrición clínica del Instituto Internacional de Ciencias de la Vida (ILSI-Brasil). Se observó que el uso de indicadores de calidad de la terapia nutrición al permitió la identificación de los procesos de cumplimiento y no conformidad, que aún requieren ajustes adicionales.

Palabras clave: terapia nutricional; indicadores de calidad de la atención de salud; nutrición enteral; nutrición parenteral; gestión de la calidad.

1 INTRODUCTION

Malnutrition is still a recurring finding that negatively impacts the patient's prognosis, reduces bed turnover, and increased hospital costs. Due to the fact that nutritional status interferes directly with clinical evolution, nutritional therapy (TN) is a therapeutic alternative for recovery or maintenance of nutritional status when the total or partial impossibility of oral feeding occurs. However, despite the existence of legislation, consensus and guidelines for implementation of nutritional therapy, studies still point to problems such as delayed onset of

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therapy, inadequate prescription and administration, metabolic and gastrointestinal complications, conduct discrepancies, among others (CUNHA; SALLUH; FRANCA, 2010). Thus, the idea of incorporating the overall quality management in patient care, allowing to identify and to reduce the non-conformity between the predicted and the daily reality of nutritional therapy. Thus, all patients on nutritional therapy should be monitored routinely, and this evaluation should ensure assertive behaviors and favorable outcomes, such as low-cost clinical recovery (WAITZBERG, 2008).

The purpose of intensive care units (ICUs) is to deliver healthcare to critically ill patients, and nutrition therapy is part of the intensive care arsenal-hence the interest in improving its effectiveness (VALENTIN; FERDINDANDE; ESICM..., 2011). However, inadequacies in nutritional support are a common occurrence in this setting (RIBAS; GARCIA; ABIB, 2014; SHIROMA *et al.*, 2015; LEE *et al.*, 2017).

Quality control in intensive care, a topic of increasing urgency and discussion, is equally pertinent to nutrition therapy. Quality indicators can allow improvements by measuring the effectiveness of a given process (VALENTIN; FERDINDANDE; ESICM..., 2011; VERROTTI *et al.*, 2012; BRAUN *et al.*, 2013). Despite the absence of set rules for applying indicators, the Clinical Nutrition Taskforce of the Brazilian chapter of the International Life Science Institute (ILSI-Brasil) has proposed a list of 36 indicators applicable to nutrition therapy (WAITZBERG, 2008).

Drawing on a consensus of healthcare professionals and the scientific community, Verotti *et al.* (2012) selected ten top indicators from the ILSI-Brasil list regarded as potentially most relevant and applicable. Other investigators have discussed and applied quality indicators, pointing out the importance of their use for continuous evaluation of nutrition therapy quality (VEROTTI *et al.*, 2012; BRAUN *et al.*, 2013; CENICCOLA; ARAÚJO; AKUTSU, 2014).

In this context, the aim of the present study was to evaluate the quality and effectiveness of current nutritional therapy practices in the adult ICU of a teaching hospital applying nutritional therapy quality indicators (NTQIs).

2 MATERIALS AND METHODS

For this observational, cross-sectional, retrospective investigation, secondary data were collected from the records of patients treated at the adult ICU of a teaching hospital in Campo Grande county, Mato Grosso do Sul state, Midwest Brazil, between July 1, 2012, and July 31, 2013.

Criteria for inclusion were as follows: being 18 years of age or older and having received enteral nutrition therapy (ENT), parenteral nutrition therapy (PNP), or both. Data collection was carried out by a trained researcher and entered in a semi-structured form. The variables investigated were age, sex, diagnosis, clinical outcome, and length of hospital stay, supplemented with information required for the evaluation of quality indicators. Statistical analysis was performed using SPSS software, version 22.0, adopting a significance level of 5%. Target quality rates and the formula for calculating indicators were those proposed by Waitzberg (2008). NTQIs were expressed as percent or per mil target rates, as recommended by ILSI-Brasil.

The study was approved by the Research Ethics Committee of the Federal University of Mato Grosso do Sul (permit 438 328, issued 28, Oct. 2013).

3 RESULTS AND DISCUSSION

In the study period, 117 patients were admitted to the ICU, 95 (81.19%) of whom met the inclusion criteria (Table 1).

Table 1 – Distribution of patients, by study variable

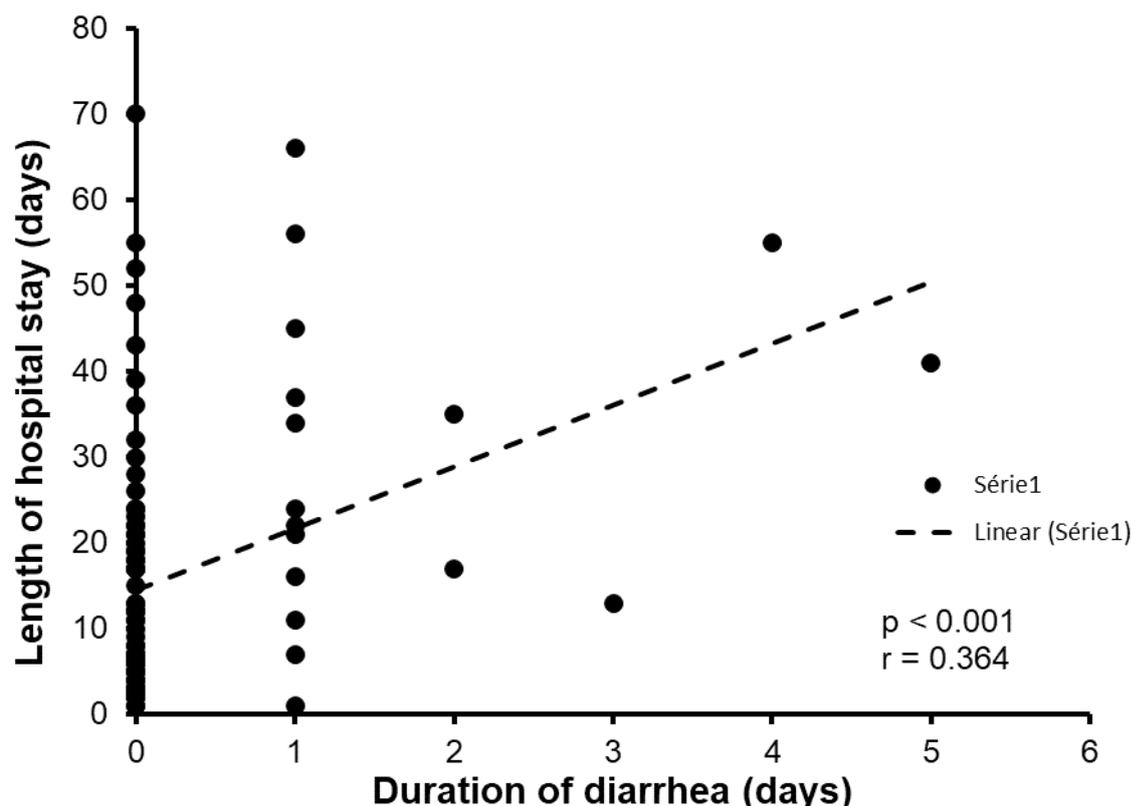
| Variable | N | % | Mean ± SD |
|---------------------------------------|----|-------|---------------|
| Sex | | | |
| Males | 56 | 58.95 | – |
| Females | 39 | 41.05 | – |
| Age (years) | | | |
| Adults | – | – | 63.14 ± 19.51 |
| Older adults* | 38 | 40 | – |
| | 57 | 60 | – |
| Diagnosis | | | |
| Pneumonia | 29 | 30.52 | – |
| Sepsis | 18 | 18.95 | – |
| AIDS | 14 | 14.74 | – |
| Other | 34 | 35.79 | – |
| Length of hospital stay (days) | – | – | 16.56 ± 16.00 |
| Clinical outcome | | | |
| Discharge | 2 | 2.10 | – |
| Transfer | 3 | 3.16 | – |
| Death | 89 | 93.68 | – |
| Extended ICU stay | 1 | 1.05 | – |
| Nutrition therapy | | | |
| ENT + PNT | 5 | 5.26 | – |
| PNT | 13 | 13.68 | – |
| ENT | 90 | 94.73 | – |

* Elderly: ≥60 years; SD: standard deviation; ENT: enteral nutrition therapy; PNT: parenteral nutrition therapy.

Source: Authors (2013).

No significant difference in fatal outcomes was observed between the two age groups ($p = 0.850$). Length of hospital stay was similar for both age groups ($p = 0.592$), but significantly higher ($p = 0.005$) in patients with diarrhea (29.94 ± 4.80 days) than without diarrhea (13.85 ± 1.57 days). A significant (albeit not pronounced) positive linear correlation was observed between diarrhea duration and length of hospital stay ($p = 0.001$; $r = 0.364$) (Figure 1).

Figure 1 – Pearson's linear correlation between duration of diarrhea and length of hospital stay



Authors (2013).

No association was observed between nutrition and ensuing hypoglycemia ($p = 0.673$) or hyperglycemia ($p = 0.661$). Duration of fasting was not associated with prescription ($p = 0.529$), nutritional assessment ($p = 0.407$), or hypoglycemia ($p = 0.141$). However, over 50% of patients ($n = 53$) were fasted for more than 24 h, 39.6% of whom ($n = 21$) developed hypoglycemia.

Other results shown in Table II are derived from NTQIs.

Table 2 – Target rates expected, and results achieved, based on Nutrition Therapy Quality Indicators

| Indicator ¹ | Equation Formula ¹ | Result (%) | Target rate |
|---|--|------------|-------------|
| Frequency of nutritional screening among inpatients | $\frac{\text{Nutritional screenings per 24 h} \times 100}{\text{Total admissions}}$ | 0 | >80% |
| Frequency of diarrhea episodes among patients on ENT | a) $\frac{\text{Patients with diarrhea during ENT} \times 100}{\text{Patients on ENT}}$ | 16.84 | <10% |
| | b) $\frac{\text{Days with diarrhea during ENT} \times 100}{\text{Total days on ENT}}$ | 2.19* | |
| Frequency of accidental dislodgment of nutrition catheter among patients on ENT | $\frac{\text{Accidental dislodgment of nutrition catheter} \times 100}{\text{Patients on ENT} \times \text{days with enteral catheter}}$ | 0.0026* | <5% |

| Indicator ¹ | Equation Formula ¹ | Result (%) | Target rate |
|--|---|------------|-----------------------|
| Frequency of nutrition catheter obstruction among patients on ENT | a) $\frac{\text{Obstructed enteral catheters} \times 100}{\text{Patients on ENT} \times \text{days with enteral catheter}}$ | 0* | <5% |
| | b) $\frac{\text{Obstructed enteral catheters removed} \times 100}{\text{Patients on ENT} \times \text{days with enteral catheter}}$ | 0* | |
| Frequency of fasting longer than 24 h among patients on ENT | $\frac{\text{Patients fasting for more than 24 h} \times 100}{\text{Patients on NT}}$ | 55.79 | ≤12% |
| Frequency of impaired glucose levels among patients on ENT and PNT | a) $\frac{\text{Hyperglycemic patients} \times 100}{\text{Patients on ENT, PNT, or both}}$ | 68.42* | 70-80% ¹ |
| | b) $\frac{\text{Hypoglycemic patients} \times 100}{\text{Patients on ENT, PNT, or both}}$ | 32.63 | 5.1-6.9% ¹ |
| Frequency of measurements of estimated EE and protein needs among patients on NT | $\frac{\text{Patients on NT with measured EE} \times 100}{\text{Patients on ENT}}$ | 68.42 | ≥80% |
| Frequency of CVC infection among patients on PNT | $\frac{\text{Episodes of CVC infection} \times 1000}{\text{Days on catheter}}$ | 6.49* | <10% ² |
| Frequency of ENT nonconformity to guidelines | $\frac{\text{Patients on ENT noncompliant with guidelines} \times 100}{\text{Patients on ENT}}$ | 20.00 | <13.5% |
| Frequency of SGA among patients on NT | $\frac{\text{Patients on NT subjected to SGA} \times 100}{\text{Patients on ENT}}$ | 0 | >75% |

¹ Waitzberg (2008).

Source: Authors (2013).

Analysis of NTQIs revealed that no patients underwent nutritional screening, despite a minimum goal of 80%. In a study of Dutch hospitals, Leistra *et al.* (2014) found that nutritional screening in the first 24 h of hospitalization ranged from 51.3 ± 27.9% in 2007 to 72.1 ± 16.8% in 2010. Higher rates were observed in hospitals that followed screening protocols. Ideally, all hospitalized patients should be screened to identify the degree of complexity required for nutritional care. Nutritional screening has been acknowledged as the initial step in the treatment of malnutrition and should be carried out by the admissions team (RASLAN *et al.*, 2010; RASLAN *et al.*, 2011; POULIA *et al.*, 2012).

In the present study, diarrhea occurred in 16.84% of patients on ENT—a higher rate than the maximum expected of 10%, even though the percentage of days with diarrhea (2.19%) met the established target. Cartolano, Caruso and Soriano (2009) reported a frequency of 6.76% for diarrhea. Because this is a common complication among critically ill patients (2-95%), standardizing its definition by means of a protocol to be followed by the multidisciplinary team is a crucial step for diagnosis and treatment of diarrhea (McCLAVE *et al.*, 2016; BTAICHE *et al.*, 2010; POLAGE; SOLNICK; COHEN, 2012).

In the present investigation, accidental removal of enteral nutrition catheters occurred in only three patients—a 0.0026% rate, desirably lower than the target value (<5%), and even lower than that of 0.22% found by Cartolano, Caruso and Soriano (2009). Obstruction and other mechanical problems with nasogastric tubes can further impair nutritional support (KREYMANN, 2010).

Of patients on ENT, 55.79% were fasted for at least 24 h. Ribas, Garcia and Abib (2014) found that 18.49% of the interurrences during the ENT were due to a pause for exams or procedures. Among ICU patients, fasting is associated with increased morbidity and mortality (SINGER *et al.*, 2009). Heyland *et al.* (2010) advocate the use of protocols to decrease the number and duration of fasting periods, thus promoting early implementation of enteral nutrition and reducing barriers to its delivery.

In the present investigation, a satisfactory rate (68.42%) of hyperglycemia episodes was observed. Hypoglycemia, however, proved more frequent (32.63%) than desired, an outcome which may have stemmed from a number of factors, including the high prevalence of fasting for more than 24 h (55.69%). Nonetheless, no correlation was observed between fasting and hypoglycemia ($p = 0.141$) or administration of insulin or hypoglycemic drugs. Although a target range of 140-180 mg/dL for blood glucose has been advocated, protocols should be developed in-house, based on the profile of patients observed at each ICU (NICE-SUGAR STUDY INVESTIGATORS, 2009; MARTINDALE *et al.*, 2009; McCLAVE *et al.*, 2016).

Of the patients investigated, only 68.42% had their nutritional needs met, in contrast with the 100% rate (from a target value of over 80%) observed by Cartolano, Caruso and Soriano (2009). Identifying nutritional requirements for specific clinical conditions is crucial to ensure early implementation of an adequate protein energy supply plan (KREYMAN, 2010; SCHÖNHERR, 2012).

A 6.49% rate of central venous catheter (CVC) infection, meeting the target rate (<10%), was found in the present study. The incidence of infections related to parenteral nutrition CVCs varies from 1.3% to 26.2%—one of the most serious complications of parenteral nutrition. However, previous research attempting to identify PNT as an independent cause of CVC infection has proved inconclusive (SHIROMA *et al.*, 2015).

The indicator employed to evaluate ENT conformity with guidelines revealed a higher non-conformity rate (20.00%) than the proposed target (<13.5%). Analysis of this indicator was based on international recommendations on type of support and protein-energy supply (SINGER *et al.*, 2009; McCLAVE *et al.*, 2016; MARTINDALE *et al.*, 2009; SCHÖNHERR *et al.*, 2012).

Finally, Subjective Global Assessment (SGA) frequency was zero, in stark contrast with the proposed target of over 75%. SGA has been considered a gold standard for nutritional assessment in the hospital setting, for its validity, reliability, and ease of use (RASLAN *et al.*, 2011; AGARWAL *et al.*, 2012; POULIA *et al.*, 2012; VEROTTI *et al.*, 2012).

NTQIs can reveal the effectiveness of processes, identifying critical points, conformities, and potentialities in nutrition support (WAITZBERG, 2008; VEROTTI *et al.*, 2012). The ICU investigated belonged to a teaching hospital where turnover of residents from different backgrounds is high and protocols for routines and nutrition therapy procedures are lacking—features that can explain the results obtained, given the variability of policies adopted by different professionals, not always corresponding to the guidelines governing this investigation. The absence of specific protocols for assessing the factors preventing appropriate nutritional support in more detail represents a limiting factor. Moreover, failures in nutrition therapy cannot be attributed to a lack of protocols. Schönher *et al.* (2012) raised the possibility of team members holding insufficient knowledge of nutrition. Protocol implementation should be combined with in-service training and continuing education for all team members involved at some point in the nutrition support process (HEYLAND *et al.*, 2010).

In the present study, non-conformities and weaknesses in nutrition support were identified with respect to the goal of NTQIs—namely, facilitating the achievement of high-quality as part of a quality assurance effort in nutrition therapy, intended to provide efficient routines, reduced costs, and practices founded on the scientific literature, with the ultimate goal of improving clinical outcomes and quality of life among critically ill patients performance (VEROTTI *et al.*, 2012; CENICCOLA; ARAÚJO; AKUTSU, 2014).

4 CONCLUSION

This study, the first applying NTQIs to reveal the quality of nutrition therapy at the ICU investigated, allowed non-compliances to be identified and corrective measures to be suggested, thereby ensuring an adequate supply of nutrients, based on nutritional assessment measures and continuous monitoring, and maintaining or restoring the nutritional status of critically ill patients, with a positive impact on their evolution during hospitalization.

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