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Review Articles

Total parenteral nutrition – an integrative literature review

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ABSTRACT

Aim: To ascertain the main features of the literature relating to total parenteral nutrition by identifying the main complications presented by patients who underwent this therapy and describe the main nursing care for these patients. **Method:** An integrative literature review from 1995 to 2011; Databases: LILACS, SciELO and BDENF. Results: Final sample was composed of 19 articles. **Discussion:** Central venous catheter infection, liver disorders, lung disorders, thromboembolic events, extravasation during infusion of the solution and hematological disorders were the main complications presented by patients who received total parenteral nutrition. Nursing care was related to the control of central venous catheter infection and the clinical management of patients with total parenteral nutrition and infusion control. **Conclusion:** The administration of total parenteral nutrition involves simple actions. The nurse must assume her role within the team, ensuring optimum performance, instruction and training to promote an effective service to patients.

Keywords: Nursing; Parenteral Nutrition, Total; Parenteral Nutrition.

INTRODUCTION

Total Parenteral Nutrition (TPN) has been used since approximately 1960, when Dudrick et al. demonstrated the ability to maintain a living organism by feeding exclusively intravenously. Since then, TPN has been used when patients are unable to feed normally. However, it is essential to know whether its use would benefit the patient, because constant bowel rest can impair its function and integrity[1].

To ensure the effectiveness of parenteral nutrition, Ordinance no. 272, from the Ministry of Health, April 8, 1998 and resolution no. 63, of the National Health Surveillance Agency (ANVISA) was created. These regulate the mandatory training with regard to Multidisciplinary Team Nutrition Therapy (EMTN) in Brazilian hospitals. The associated assignments have several technical-administrative aims; to conduct nutritional screening and surveillance; to assess nutritional status, to indicate metabolic and nutritional therapy; to ensure optimal conditions of appointment, prescription, preparation, storage, transportation, administration and control; to educate and train staff, to create protocols, and to analyze the costs and benefits of operational aims with regard to EMTN[2,3 - 4].

TPN is always indicated in the following cases[1,5]:

- Malnutrition indicated by a loss of body mass index greater than 15%;
- Interference diseases based on ingestion, digestion and absorption of foods;
- Hypermetabolic conditions including large burns, septic patients, extensive multiple trauma, acute pancreatitis and intestinal fistula.

To be effective, TPN needs special care from a multidisciplinary team, including nurse staff, who are responsible for the administration and prescription of nursing care in hospitals, ambulatory and home care, in terms of serving the nutritional needs of the patient and allowing his rehabilitation[6-7].

Associated with this context, it is notable that patients who use TPN are more prone to complications, given the basic pathologies that require this type of nutritional therapy. So, they are patients who need particular attention and care, not only in terms of the

technical and scientific knowledge on the part of nurses involved in administration of the TPN, but mainly in an awareness of priority care, to ensure the efficacy of the nutritional management of patients who are often critically ill.

In line with the findings of other authors, it is believed that nursing staff have a key role to play in controlling TPN, regarding the installation maintenance of the equipment and the monitoring of the possible reactions that the patient may develop during therapy. In addition, to achieve the therapeutic aims, and ensuring the welfare and comfort of the patient, requires professional knowledge and attention being paid to understanding the complexity and fragility of the human being[8].

Within this scope, the choice of the theme was established through the professional interest of the author in exploring the scientific databases to identify studies that address this issue, in order to ascertain the main features of the scientific publications relating to TPN; to identify the main complications related to the therapy of patients on parenteral nutrition; and to verify the established nursing care for these patients.

METHOD

To achieve the proposed aims, we chose to develop a research project based on an integrative literature review[9] that allows searching, critical appraisal and synthesis of the available evidence on the nursing role during parenteral nutrition therapy, thereby enhancing and updating the current knowledge of the subject. In terms of the method, we used the following steps: establishing the research question, undertaking a literature search, categorization of studies; assessment of studies to be included in the review, interpretation and presentation of the results of the review.

This investigation was conducted in terms of the following guiding questions:

- Have patients on parenteral nutrition been exposed to health complications related to this therapy?

- Are grants available at the national level for the identification of the main care demands of these patients?

Criteria for inclusion and exclusion

The inclusion criteria adopted to guide the search and to select the publications are:

- Publications (articles in periodicals, theses and dissertations) on the TPN theme, especially the difficulties, the care, the interventions proposed, and variables that influence the treatment of these patients.
- Published in Portuguese and English;
- Published between 1995 and 2010.
- Indexed in the following databases: Latin American and Caribbean Health Sciences (LILACS), Scientific Electronic Library Online (SciELO) and Database of Nursing (BDENF).
- Items containing the descriptors: Nursing, Parenteral Nutrition, Total Parenteral Nutrition. All these have been validated through the Health Sciences Descriptors (DESC).

Exclusion criteria were:

- Publications that are not in Portuguese and English;
- Studies published before 1995.

Survey of the studies

In order to increase the specificity of the studies, we undertook a cross-descriptor search of peer reviewed publications. Methodologically we made a decision not to search for publications which included all three descriptors, because we observed a significant reduction in the number of publications when we tried this. The survey was conducted concurrently in all databases, in July 2010, through the portal on the Internet Bases and Virtual Health Library of BIREME, Specialized Center of the Pan American Health Organization (http: //www.bireme.com.br). In situations in which the publications were

not available, we accessed direct pages from the journals and direct searches of electronic reference libraries, including the BIREME library. We also used, through electronic contacts with the authors through the system of curriculum lattes when there was difficulty accessing the full text. In terms of the inclusion of studies we carefully read the title and summary of each publication in order to verify compliance with the guiding question of the research. When there was doubt about the inclusion or exclusion of a study, it was read in its entirety and a decision with regard to conclusion was then made.

Data Collection Instrument

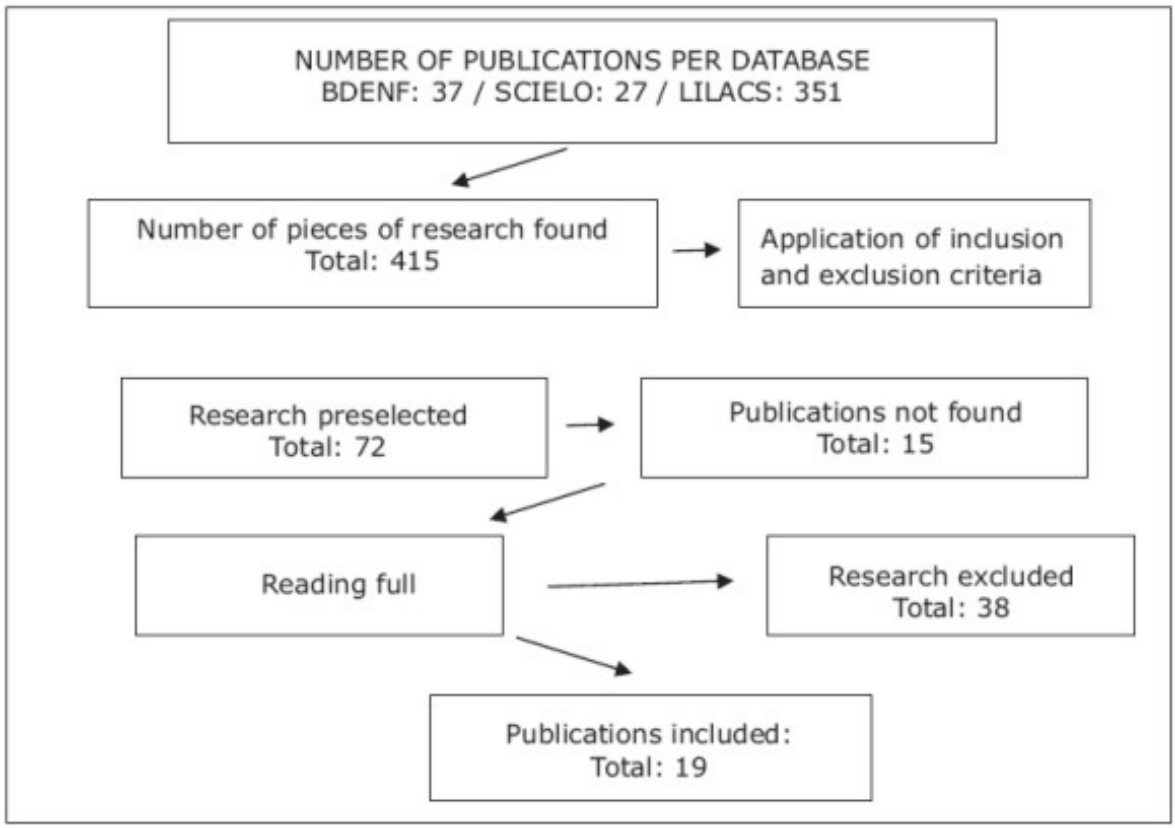
The selected studies were analyzed in December 2010. For proper categorization of the data, we conducted a data collection tool to filter what in practice would be required, such as: title, author, publisher/publication/journal, year of publication, professional category of authors, country of origin of the study availability, type of publication, aim, qualitative or quantitative approach, complications related to the therapy of patients submitted to TPN and nursing care.

For presentation of the review we created a database in Microsoft Office Excel 2007, to allow the extraction, organization and summarization of the information. The same program was used for the statistical treatment of data, which was performed by constructing frequency tables and percentage.

RESULTS

A total of 415 publications were found, of which 396 (95.42%) were excluded because 116 (27.95%) did not correspond to the language of the study, 160 (38.55%) were repeated in the database, 67 (16, 14%) were published before the year 1995, 15 (3.61%) were not found and 38 (9.15%) did not meet the research aims Details are provided in Table 1.

TABLE 1: Flowchart of data analysis and selection of studies. São Paulo, 2011.



Characteristics of selected studies

From the 19 selected studies, seven (36.84%) discuss the care of patients receiving TPN, five (26.31%) describe the care and complications associated with these patients during TPN, and seven (36.84%) dealt with complications related to this therapy. The selected studies are detailed in Table 2.

TABLE 2 - Selected studies for integrative literature review. São Paulo, 2011.			
1º author	Title	Year	Origin
Edinéia FM	The nurse in praxis of peripherally inserted central catheter in newborn.	Brazil	1995
Consuelo HAFL	Nurse care for the patient in parenteral nutrition	Brazil	2005
Cunha AJLA	Asymptomatic cholelithiasis in extreme premature children.	Brazil	2000
Fernando KJF	Hematologic disorders in trauma patients during	Brazil	1996

	parenteral alimentation with lipids.		
Carvalho PRA	Cholestasis associated with parenteral nutrition: infection as a main risk factor.	Brazil	1995
Polak YNS	Sociality in disease in the context of a nutritional support unit.	Brazil	2001
Polak YNS	Self-care in nutritional support: myth or possibility?	Brazil	2001
Machini JS	Parenteral nutrition - general principles, prescription and monitoring.	Brazil	1998
Santos DMV	Nurse specialists in nutrition therapy in Brazil: where and how they act.	Brazil	2005
Falcão MC	Nutrition in surgical-pediatric patients: pre- and post-operative approaches.	Brazil	2002
França JCB	Candidemia in a Brazilian tertiary care hospital: incidence, frequency of different species, risk factors and antifungal susceptibility.	Brazil	2008
Uenis T	Short bowel syndrome in children - treatment with home parenteral nutrition	Brazil	2004
Maria RDLU	Venous catheters totally deployed for parenteral nutrition: care, length of stay and infectious complications.	Brazil	2005
Serapião M	Necropsies of neonates factor of quality improvement in neonatal ICUs.	Brazil	2007
Sztajnbok J	Acute abdomen due to late retroperitoneal extravasation from a femoral venous catheter in a newborn.	Brazil	2002
Juliana DCM	Asymptomatic patients have venous catheter infections related to parenteral therapy.	Brazil	2009
Kemp R	Live disease associated with intestinal failure in small bowel syndrome.	Brazil	2006
Tardin FA	RTPA and aspirin use in the treatment of intracardiac thrombosis in newborns.	Brazil	2006
Valmim RS	Lung lesions and total parenteral nutrition in children admitted to the intensive care unit.	Brazil	2005

Identification of complications related to the therapy of patients undergoing TPN

All the complications that are described below (Table 3), were identified in 12 (63.15%) articles among the 19 (100%) selected. Some publications cited more than one complication.

TABLE 3: Complications related to TPN. São Paulo, 2011. n=12

Complications	**N.º**	**%**
Infection of the central venous catheter for TPN.	04	33,33
Liver alteration.	05	41,66
Lung alteration.	02	16,66
Thromboembolic events due to the infusion catheter.	01	8,33
Leakage of solution for infusion.	01	8,33
Hematologic disorder.	01	8,33
Total	14	116,64

*More than one complication was reported in some publications.

Identification of nursing care for patients undergoing therapy with TPN

The nursing care described below (Table 4) were identified in 12 (63.15%) publications, among the 19 (100%) selected. Although some publications have not been designed for nurses, they cite care that may be performed by nurses, doctors and nutritionists.

Nursing care was divided into clinical care and laboratory tests, for a clearer understanding.

TABLE 4: Clinical care for patients undergoing TPN. São Paulo, 2011. n=12

Care	N.º	%
- Clinical Care		
Perform infection control / maintenance of the catheter for infusion	07	58,33
Weight control		
Control of water balance	02	16,66
Using exclusive infusion	02	16,66
Store in refrigerator at 4 º C	01	8,33
Keep at ambient temperature for infusion	01	8,33
Use continuous infusion pump	01	8,33
	01	8,33
- Laboratory test		
controlling blood glucose		
Make biochemistry	02	16,66
	02	16,66
Total	19	158,29

*More than one care was described in some publications.

DISCUSSION

When starting a critical analysis of the selected studies, there was an unfortunate scarcity of nursing publications on the topic of TPN. The number of publications by doctors was more than double the publications by nurses.

Among the 12 publications related to care, seven (58.33%) were published by doctors and only five (41.66%) by nurses. Interestingly, only three (60%) of these publications were published by nurses in nursing journals, two (40%) by nurses in nutrition journals, and seven (58.33%) other doctors in medical journals.

Complications related to the treatment of patients who underwent TPN

The maintenance of the central venous catheter for the infusion of TPN was one of the major complications described during the analysis of the articles. The pathogenesis of the infection of catheters is related to the deposit of microorganisms in the catheter upon insertion, their migration through the skin and along the catheter, and contamination of both the connection and the infusion liquid in addition to the infection focus distance[10].

One study[11] reported that complications related to TPN were responsible for 12 deaths, nine by systemic infection and two due to a massive pulmonary embolism, both caused by the prolonged presence of the catheter in the central vein.

In another study involving 16 patients who underwent the implantation of a central venous catheter for the infusion of TPN, there were 21 episodes of infection, where the most common etiologic agent was Staphylococcus epidermidis (57%), followed by fungi, gram negative bacilli (E.Coli, Serratia Marcescens, Enterobacter Cloacae) and Staphylococcus aureus. The colonization by Staphylococcus epidermidis can be explained by the immunosuppression of patients and the overuse of antibiotics, leading to the development of resistant strains[10].

One article[12] sought to describe the pulmonary lesions related to the TPN through the autopsies of patients aged 15 years, who died in the ICU. We observed a significant relationship between the infusion of TPN with interstitial lung lesions consistent with diffuse alveolar damage, pneumocyte hyperplasia and pulmonary septal fibrosis. The acute respiratory distress syndrome and microthromboembolism was more frequent in the group receiving TPN. However, a multivariate analysis involving logistic regression, taking into account prematurity and length of hospital stay, showed that the TPN was the only independent factor with regard to fibrosis.

Hepatocellular disorders due to TPN were cited in several publications. The authors[11] reported that all the children studied had some type of disorder during treatment, such as hepatomegaly, icterus, increased serum levels of transaminases, bilirubin and gammaglutamil transpeptidase, while one child was diagnosed with acute liver failure. Therefore, it was not possible to determine whether or not these effects were dependent on TPN or on any outbreak of systemic infection at the catheter site.

TPN, while providing increased survival in patients with intestinal failure, is a potential source of complications such as sepsis, hyperglycemia, venous thrombosis and liver disease. However, the liver disorders during TPN have not yet been fully elucidated[11-13].

The extravasation of TPN in the stomach, through the femoral catheter, was only discussed in one article[14]. The same reports that this complication is rarely described, but it can happen due to the extravascular migration of the catheter tip, leading to retroperitoneal extravasation. The solution and the patient then evolves to a clinical case of acute abdomen. In this research, the simple removal of the catheter was sufficient to improve the acute abdomen without the need for surgery.

The article on hematological disorders in trauma patients during parenteral nutrition with lipids indicates that these disorders are rare. However, during the parenteral feeding of six adults with traumatic injuries, the eosinophilia and/or leukopenia was observed after periods of four days to five weeks. Some patients were septic, but antibiotics and other prescriptions did not change. Only the nutritional regimen was discontinued. This normalized the haematological profile, suggesting that it was an allergic reaction to acute parenteral nutrition with lipids[15].

It is interesting to note that most of the articles dealing with complications related to TPN could have been avoided if the nursing staff had taken greater care.

Nursing care for patients undergoing therapy with TPN.

DIAGRAM 1: Nursing care with central venous catheter; clinical care and care TPN infusion. São Paulo, 2011.

CONCLUSION

It has been possible to identify central venous catheter infection, hepatic and pulmonary disorders, thromboembolic events due to a catheter, extravasation during infusion solution and hematological disorders as the major complications presented during therapy involving TPN.

The main nursing care described are related to the prevention of infection associated with the central venous catheter for the infusion of TPN, the clinical management of the patient with TPN, and control infusion associated with TPN.

The analysis allows us to realize that the administration of TPN involves simple actions, but requires total involvement on the part of the professional. But nursing staff must assume their role with regard to providing expertise, training and education to promote an efficient and effective service to patients.

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