

Nursing protocol for the management of total parenteral nutrition: Standards of care and patient safety

Protocolo de enfermería para la gestión de la nutrición parenteral total: Estándares de cuidado y seguridad del paciente

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ABSTRACT

Objective: To establish efficient and safe management of the clinical process related to parenteral nutrition, both in its preparation and administration. **Methodology:** Systematic review of 32 scientific documents. **Results:** The procedure for the preparation and administration of TPN, given that it is an infusion that goes directly into the bloodstream and therefore the complications that may arise are of vital importance, and thus ensure patient safety. **Conclusion:** There is a need to implement a standardised protocol and consolidate this information in different healthcare facilities on the preparation of TPN. This is of great importance in reducing the risk of complications and thus contributing in general to recovery and reintegration into daily life, depending on the case or condition. **Descriptors:** parenteral nutrition; enteral nutrition; diet, food, and nutrition. (DeCS).

RESUMEN

Objetivo: establecer un manejo eficiente y seguro del proceso clínico relacionado con la nutrición parenteral, tanto en su preparación como en su administración. **Metodología:** revisión sistemática de 32 documentos científicos. **Resultados:** El procedimiento en la preparación y administración de la NPT, puesto que es una infusión que va directamente al torrente sanguíneo y por ende las complicaciones que se pueden presentar son de vital importancia, y de esta manera garantizar la seguridad del paciente. **Conclusión:** Existe la necesidad de implementar un protocolo estandarizado y consolidar esta información en las diferentes casas de salud sobre la preparación de la NPT es de gran importancia para reducir riesgos de complicaciones así contribuir de manera general en la recuperación e incorporación a la vida cotidiana según sea el caso o la condición.

Descriptores: nutrición parenteral; nutrición enteral; nutrición, alimentación y dieta. (DeCS).

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Original Article



INTRODUCTION

Total parenteral nutrition (TPN) is a vital intervention that can save lives when administered correctly, with the right equipment and under strict parameters. However, its use remains largely restricted to critical care settings, with limited application in other hospital wards. According to a systematic review by Eriksen (1), very few hospitalised patients receive TPN, largely due to the associated risks, such as serious complications that can lead to infections and increased mortality. TPN is also linked to longer hospital stays and, therefore, higher healthcare costs. Despite its effectiveness, more clinical evidence is needed to support its benefits and potential complications. This makes it urgent to create standardised protocols for the preparation and administration of TPN, as well as ongoing training for nursing staff. Although many studies come from doctors and biochemists, it is crucial that nurses are actively involved, as their role is fundamental in the care of these patients.

Parenteral nutrition, in contrast to enteral nutrition, must be adjusted to the clinical condition, age and sex of the patient. It can be used either totally, when the aim is to completely cover nutritional needs, or partially, when nutrients are supplied according to the requirements established by the healthcare team. Venous access for TPN infusion includes:

- Central venous catheter, indicated for long-term hyperosmolar TPN.
- Peripheral venous catheter, suitable for short-term TPN with lower osmolarity.

Both routes carry a risk of infection and thrombosis (2). Malnutrition causes alterations in systemic functions, such as a decreased immune response, especially in patients with a history of hypertension, type II diabetes mellitus or smoking. For this reason, early administration of nutrients, either enterally or parenterally, has



become an essential therapeutic method in critically ill patients and those with sepsis. Although parenteral nutrition does not always shorten the duration of mechanical ventilation, it does help to restore the intestinal mucosal barrier, stabilise the gastrointestinal flora and reduce tissue damage associated with inflammation. Higher mortality rates (1 in 3) have been observed in patients with late initiation of artificial nutrition compared to those who receive it early (1 in 6) (3).

According to Wanden et al. (4), in adult hospitalised patients, the most frequent indications for TPN are palliative cancer care. In Spain, it is also administered at home when hospitalisation is not strictly necessary, ensuring nutritional intake in patients with cancer treatment failure or oral intolerance. The NADYA group recommends that home administration be regulated by the health authority, as sterility and staff training may be compromised outside the hospital setting.

Nutrition is a fundamental biological process for the digestion and absorption of nutrients. When oral intake is impossible, enteral nutrition (EN) or parenteral nutrition (PN) is used to ensure nutritional stability in complex clinical situations (5). TPN provides clinical benefits such as improved serum albumin and protein levels and reduced hospital stay, but it also carries risks: catheter-related infections, electrolyte imbalances, micronutrient deficiencies, intestinal mucosal atrophy and emotional disorders (6).

In burn patients, the combination of TPN and EN allows the high caloric and micronutrient requirements necessary for healing to be met, reduces the length of stay in the ICU and facilitates the return to oral feeding (7). TPN administers aqueous solutions of macronutrients (carbohydrates, proteins, lipids), micronutrients (vitamins, minerals, electrolytes) and water through central or peripheral venous access (8).

Nutritional intervention in the ICU is essential to preserve muscle mass and provide



adequate protein. Nursing staff responsible for managing EN and PN must be properly trained and follow strict protocols to ensure patient safety (9). TPN has absolute contraindications (functional gastrointestinal tract, oral intake possible; severe uncontrolled infections) and relative contraindications (haemodynamic instability, immunocompromise, multiple organ failure, psychological disorders) (10). Its complications are classified as metabolic, infectious, and mechanical (11).

Calcium and phosphate precipitation in TPN, favoured by high concentrations and temperature, is particularly common in incubator-born neonates (12). The safety and efficacy of TPN depend on the preparation environment, technique, and staff training. A study in 40 ICUs in Spain (370 patients) showed that 65–85% of solutions are prepared in hospital pharmacies using ‘all-in-one’ bags, highlighting the importance of specialised management (13).

Calorie and protein requirements vary according to the condition and progress of the patient in the ICU; after three days of admission, an average of 92.43% of the prescribed kcal are administered (14). The proposed protocol will be implemented in emergency departments, clinical areas, surgical wards, ICUs and paediatrics, where TPN is prescribed. Nursing staff, with appropriate training, will be responsible for preparing and administering TPN, ensuring asepsis and safety. The aim is to improve the practice of the multidisciplinary team, reduce infectious and mechanical complications, and optimise the quality of treatment and patient care.

The article aims to establish efficient and safe management of the clinical process related to parenteral nutrition, both in its preparation and administration.

METHOD

Literature review: the search was conducted using five scientific databases with high impact: PubMed, Scopus, Web of Science, CINAHL and Cochrane Library, selected for their recognition and coverage in the field of health sciences.



The search design was structured using controlled terms from the MeSH (Medical Subject Headings) and DeCS (Descriptors in Health Sciences) thesauri. These keywords were strategically combined with Boolean operators, such as 'AND' and 'OR', to maximise the efficiency of the results. Expressions such as 'total parenteral nutrition AND nursing protocol' or 'patient safety AND intravenous nutrition' were used to adjust the terms according to the objectives of the study.

RESULTS AND DISCUSSION

1. Cover

Title of protocol: Nursing protocol for total parenteral nutrition management: standards of care and patient safety

Institution: Catholic University of Cuenca

Date of creation and/or revision: June 2025.

2. Introduction

which is why it is necessary to have knowledge not only of the procedure but also of its components, active ingredients, and the effects they produce when mixed with others, as well as being aware that they will be compatible and, above all, stable when combined, in addition to the duration of each infusion to avoid the loss of the effect of its components. Therefore, it is essential to have medical, nutritional, and pharmaceutical evaluation, and above all, to have the physical prescription in the TPN medical record with clear components and quantities, and for us, as professional nursing staff, to have clear scientific knowledge of the different components in order to prepare and administer TPN correctly. and, above all, a physical prescription in the NPT medical record with clear components and quantities. As professional nursing staff with clear scientific knowledge of the



different components, we must be able to prepare and include the different components according to their importance and effect, thus avoiding precipitation or decomposition of certain drugs due to poor dilution with others that are generally incompatible. It is also vitally important to be clear that TPN must be administered through a central line, in a single lumen and infusion, avoiding mixing with additional medications prescribed to the patient and thus avoiding complications due to these (15).

According to some studies, there is not a great deal of evidence, and what evidence there is has been of poor quality in terms of nutritional support having any effect on mortality or the appearance of serious side effects in patients. However, there is also no good-quality evidence to verify that nutritional support has contributed significantly to weight gain in adults or children receiving this treatment, either because they were considered to be nutritionally at risk or because their diagnosis required them to remain for long periods without being able to start or resume oral feeding. What has been observed instead is that in this population, what has been achieved is to maintain the necessary nutritional requirements during this time, although this will also depend on the type of patients we are dealing with, since the majority of this population is usually clinically heterogeneous (16).

In the paediatric population specifically, it is said that, for example, there is no significant difference in the duration or length of hospitalisation in terms of nutritional support via nasogastric tube, since reintegration into natural oral feeding can be achieved successfully in most children, especially on the first attempt, which prevents or reduces the onset of complications or increases the length of hospital stay. Therefore, enteral feeding, compared to the population group receiving intravenous nutritional support or TPN, in the latter group of children, there will always be additional risks of infections or complications derived from this, which will consequently increase their hospital stay (17).



The nutritional status prior to hospitalisation or surgery in each patient is essential for a speedy recovery and, in turn, for the onset of complications during hospitalisation, especially when the treatment involves gastrointestinal surgery. This is because if the patient is already admitted with an established nutritional deficit, it will be much more difficult to improve this during hospitalisation, and in the case of surgery, the postoperative results will not be as expected, or it will be more difficult to obtain good results. Weight loss, and especially muscle wasting in some or most patients who are generally in terminal stages or in critical condition due to their diagnoses, have been shown to be associated with both malnutrition and poor clinical or surgical outcomes. For these patients at high risk of malnutrition, they are often the main candidates for receiving parenteral nutrition or, failing that, enteral nutrition or any type of nutritional supplement, whether oral or parenteral, depending on their needs. Such interventions are costly and/or have unwanted adverse effects, so it is important to conduct more studies to demonstrate more accurately whether their use results in higher morbidity or mortality, or both, or whether, on the contrary, they are unrelated to these outcomes, since it has not yet been possible to verify or attribute the improvement to enteral or parenteral nutrition or to an increase in the immune system. parenteral nutrition or an increase in the immune system. What has been observed is that with the use of oral supplements, there have been no infections in general; however, their use has not been well received due to immediate unwanted effects such as nausea, vomiting, occasional diarrhoea and, consequently, abdominal pain (18).

General objective

To determine the efficient management of a clinical process during the preparation and administration of parenteral nutrition with the aim of establishing new and instructive elements of the procedure that can be used by the healthcare personnel in charge, thus avoiding complications arising from it, thereby improving the



patient's current condition and, in turn, reducing the length of hospital stay.

Scope

This protocol is designed to be implemented in various areas of the hospital environment, including clinical, surgical, and critical care units where Total Parenteral Nutrition (TPN) is prescribed. Its application extends to paediatric and adult patients who require intravenous nutritional support as part of their comprehensive management. It also includes all phases of the care process, from initial indication to monitoring and administration of TPN, ensuring safety and quality standards. This protocol seeks to standardise nursing practices in these areas, promoting evidence-based care that minimises associated risks and optimises health outcomes.

3. Definitions and Key Terms

Important terms

Total Parenteral Nutrition: The provision of a compound or prepared infusion containing various artificial components, generally micronutrients in addition to medications and hyperosmolar substances, through an external device usually inserted into a central line, although it may also be peripheral, which is used for a long period of time (19).

Enteral Nutrition: This is the administration of nutrients directly into the digestive system to correct nutritional problems or prevent malnutrition. This can be done orally or via a nasogastric, orogastric or gastrostomy tube (19).

Central venous catheter: A thin, flexible device inserted into a large central venous access in the chest or neck, through which the patient receives intravenous fluids, blood transfusions at reduced rates or in large volumes, chemotherapy and other medications, as well as being used for blood collection, especially in patients with



difficult venous access. It is used in patients with prolonged stays or treatments (20).

Acronyms: Explanation of relevant acronyms or abbreviations.

TPN: Total parenteral nutrition.

EN: Enteral nutrition.

CVC: Central venous catheter

CIP: Continuous infusion pump

4. Theoretical Framework and Scientific Evidence

TPN is considered a medication, as it is used for a specific indication, either because the patient is malnourished or because they have total or partial gastrointestinal dysfunction and cannot be fed orally or enterally. TPN is administered specifically intravenously, through a central line, according to its components, which are part of the nutrition group of medications. Each of these must be evaluated separately, as they all have different mechanisms of action, pharmacokinetics, pharmacodynamics, adverse effects, etc., which together can be potentiated if not prepared properly and in quantities according to the needs of each patient (21).

All procedures performed in a health service must be evaluated after they have been carried out, and even more so in the preparation of TPN, since it is an infusion that goes directly into the bloodstream and therefore the complications that may arise are of vital importance. That is why it is essential to carry out quality control to determine the level of errors being made, whether in preparation or administration, in order to correct them with scientific feedback to the personnel responsible for the initial evaluation, prescription, and preparation in the different health centres, as appropriate, and thus ensure patient safety (22).



This is why the need to implement a standardised protocol and consolidate this information in the different healthcare facilities on the preparation of TPN is of great importance in reducing such errors and thus contributing to improving the state of health and helping to reduce the patient's hospital stay, improving their nutritional status and, therefore, their physical condition, which will contribute in general to their recovery and return to daily life, depending on the case or condition.

According to a study carried out in a department of the Specialty Hospital, Siglo XXI National Medical Centre of the Mexican Social Security Institute, in this case the Gastrointestinal Surgery Department, one of the main complications encountered during the administration or initiation of parenteral nutrition was various infections, which, after study, were associated with the placement and/or maintenance of the central venous catheter depending on the length of time it had been in place. This indicates that the longer the user remains with this central device, the greater the incidence of infections associated with its use. Most infections occurred in the first 20 days after starting TPN, and these patients were hospitalised in critical areas such as intensive care units. Therefore, this shows us that the earlier the return to EN (enteral nutrition) or, if possible, to oral feeding, the greater the benefit and the lower the risk of readmission or further surgery, if necessary. This highlights the importance of proper preparation and, above all, a prior assessment of caloric and nutritional needs in order to achieve improvement in the shortest possible time and reduce the duration of TPN (23).

Hyperglycaemia is one of the main complications that can occur in patients on total parenteral nutrition. The difference between hyperglycaemic and normoglycaemic will depend greatly on the patient's age, previous comorbidities, the presence of corticosteroids in the treatment (a normal side effect of which is hyperglycaemia, especially if administered in high doses and at short intervals), the amounts established in the preparation, especially the glucose intake, as well as the



presence or absence of sepsis according to the initial diagnosis on admission and, in particular, the length of time the patient has been on TPN (24).

5. Description of the procedure

Materials required (19, 20):

Human resources (nursing staff)

Laminar flow hood

Sterile compresses

Antiseptic solution (70% alcohol)

Sterile gloves

Sterile drapes

Cap

Mask

Sterile gown

50 ml, 20 ml, and 10 ml syringes

20-gauge needles

Intravenous access equipment

Transfusion equipment, preferably with a filter or according to institutional protocol

Card with instructions or prescription for NPT

All-in-one bag or NPT cover

Medication according to prescription:

50%, 10% or 5% dextrose

Amino acids



15% or 20% lipids

Trace elements

Electrolytes (sodium, potassium, magnesium, calcium)

B complex

Vitamin C

Infusion pump.

Support

Waste container

Sharps container

Prior preparation

Firstly, a medical indication and a prior assessment by the nutrition department are required in order to determine the specific quantities of each component to be used in the TPN, based on the assessment and the nutritional needs of the different patients, according to their diagnoses and caloric requirements as mentioned above.

Check that a central or peripheral venous access is in place and that it is sufficiently permeable to begin the procedure.

Both the patient and their family members must be informed of the process and the need for it, its benefits, possible complications, and warning signs that should be reported to the staff if they occur.

Check for any allergies reported in the medication reconciliation.

Be familiar with the laboratory test results and the patient's metabolic status and, based on your knowledge as a nursing professional, assess the quantities



prescribed in the TPN preparation and, if necessary, consult with the doctor and nutritionist.

Step-by-step procedure (19, 20):

Gather the necessary equipment and take it to the laminar flow hood.

Place the medical instruction card in a visible place at the front, checking beforehand that the medical instructions match the patient's details.

Disinfect the laminar hood before turning it on or prepare the sterile field in the area designated for this purpose according to the medical conditions of each healthcare facility.

Place the previously disinfected material in the sterile area, strictly complying with all aseptic measures and without contaminating the area.

Wash your hands correctly in accordance with WHO guidelines.

Put on a mask, cap, gown and sterile gloves.

Begin preparation of the NPT. In the all-in-one bag, place the solutions and medication in the following order:

Dextrose at 5%, 10% or 50% in quantities according to the medical instructions transcribed on the card.

Lipids at 10% or 20% in quantities according to the medical instructions transcribed on the card.

Amino acids at 3.5%, 5.4%, 8% or 10% in quantities according to the medical instructions written on the card.

Electrolytes (sodium, potassium, magnesium, calcium) in quantities according to the medical instructions written on the card.

Trace elements in quantities according to the medical instructions written on the



card.

Vitamins: B complex and vitamin C in quantities according to the medical instructions written on the card. (The latter can be administered in the infusion together or, preferably, separately once a day, as they can cause precipitation in the general preparation due to the infusion time, since these medicines are usually photosensitive and lose their effect if not protected from light).

Note: Each time a component or electrolyte is added, gentle shaking is recommended to mix the components being added.

Once all the components of the TPN have been mixed, connect the infusion equipment inside the laminar flow hood to prevent contamination, cover the bag containing the preparation with a sterile drape and transport it to the patient for connection.

Before administering TPN, check the condition of the catheter, including its patency, condition, and whether there are any leaks or extravasation of fluid, as well as the date of placement and healing. If this central catheter (CVC) has 2 or 3 lumens, label each one for the different functions it will perform, with the distal lumen being indicated as exclusively for TPN.

Check vital signs or start continuous vital sign monitoring as needed.

Check blood glucose before starting TPN and monitor QUID, TID or BID, as needed, based on the patient's history and diagnosis.

Disinfect the catheter connector with an antiseptic solution before connecting the infusion equipment, placing sterile gauze to protect the connection (catheter-equipment) during connection.

Program the continuous infusion pump (CIP) with the total volume to be infused and the infusion time, starting at a low drip rate of 30 to 40 ml/h and gradually



increasing the drip rate according to tolerance until the rate indicated for the patient is reached, so that the preparation is infused within 24 hours.

Record on the nursing form (according to each institution's protocol): time, route, solution administered, volume to be infused, infusion time, speed or drip rate as programmed on the Continuous Infusion Pump, as well as the full name of the person responsible for administration, including their role, i.e. nurse, doctor or biochemist.

Provide safety and comfort to the patient.

Remove gloves and wash hands.

Monitor for adverse reactions at the start and during the infusion of TPN, and discontinue if necessary.

Precautions and special considerations

General care to be taken during TPN infusion:

Monitor the infusion for precipitation, which may occur in the catheter or inside the bag containing the preparation. This may depend on the infusion time or improper preparation of the solution, so precipitation may occur at any time. Therefore, initial observation and monitoring during administration are of vital importance. When an administration pump sounds, it may be due to the presence of precipitates or the infusion becoming cloudy, indicating an occlusion. For this reason, infusion equipment with a filter should be used. If the healthcare facility does not have this equipment, it should be replaced after inspecting the preparation, as it would be very dangerous for the patient to continue the infusion under these conditions (19).

Maintaining aseptic technique is essential to ensure compliance with appropriate standards for CVC management, guaranteeing the implementation and compliance with the necessary safety measures both in the fixation process and in the ongoing



maintenance of the catheter, with the sole purpose of preventing associated complications. It is recommended to label the lumens according to their use, for example, the specific lumen for TPN infusion, infusions and other medications to avoid precipitation due to unwanted mixtures. During biosafety procedures and therefore when changing infusion equipment, first ensure that all flow accesses to other solutions or return valves are closed, both on the catheter and on other connections, and change the equipment and three-way valves in accordance with each institution's biosafety standards. Perform wound care at the CVC insertion site using aseptic techniques in accordance with each institution's biosafety standards or when necessary, if the dressing is visibly dirty or moist, with an antiseptic solution and a sealing dressing with a pad in the centre, labelled with the date of application and dressing change, in order to prevent contamination and infections resulting from improper handling of the CVC (20).

Verify daily electrolyte control to ensure that values remain within normal parameters and to prevent imbalances, in addition to maintaining strict control of intake and elimination and daily water balance to prevent water overload (19).

6. Roles and Responsibilities of Nursing Staff

Assignment of roles

Nursing assessment of patients must be constant and, above all, continuous, as this is a crucial and very important aspect of nursing care, since it allows us to accurately evaluate and determine the response of patients to the medications administered and, in turn, facilitate the early identification and detection of the presence or absence of possible adverse effects. If at any time the presence of an adverse effect or reaction is suspected, the administration of the additional dose should be avoided and the patient's primary care physician should be notified, and the event should be reported in accordance with the rules and protocols of the



different institutions. Subsequent intervention will depend specifically on the type of reaction presented and the clinical assessment of the patient's condition (25).

Required competencies

The administration of medication is a specific function of nursing staff and should not be delegated to assistants or unlicensed personnel or personnel without theoretical and scientific knowledge of the medication or solution to be administered, or of the patient's condition or diagnosis, and even less so of the effects that may occur during this infusion and how to respond to these events, since they have not received adequate training to perform these functions, This is even more important in the case of Total Parenteral Nutrition, where aseptic technique must be maintained during preparation and administration (25).

The management and maintenance of central venous accesses must be carried out by trained, qualified personnel with up-to-date theoretical knowledge in the field. Training for both nursing staff and healthcare personnel in general who handle or are in charge of patients who are carriers of the same conditions, both in terms of management and, of course, prevention, must be continuous and constant over time. In addition to ongoing training, this personnel must undergo frequent evaluations to ensure that they have the necessary skills for such management (26).

Education and training

It is currently vital to include content on general and specific nutrition in nursing curricula, covering nutrition in terms of caloric needs, enteral nutrition administration, planning, preparation and administration of parenteral nutrition (as there is currently evidence that this is only a competence of biochemists and pharmacists). in order to obtain professional and trained personnel working in different health institutions and, in turn, improve both care and institutional capacity,



so that it continues to be of high quality and warmth for the patient. At the same time, training should not only be theoretical but also practical, and should be scheduled and regular in the different health institutions where this activity is carried out, in order to carry out an evaluation scheme in accordance with them and thus avoid complications arising from poor preparation or administration of NPT, or from the mishandling of a CVC. In turn, the person in charge of this training should seek the best pedagogical strategy and teaching and learning methodology so that those trained can obtain clear information and the results of the evaluations are satisfactory. Although we, as nursing staff, must focus first on working to promote health in order to maintain good nutritional status and thus avoid the need to apply this therapeutic measure (27).

7. Compliance and Quality Indicators

Evaluation criteria (20).

Aseptic technique during the preparation of TPN and the management of the CVC and its connections.

Hand washing before and after procedures.

Correct use of protective measures.

Information to the patient and family about the procedure to be performed.

Verification of local signs (such as bleeding, some infections that may be local or general, such as bacteraemia, central venous catheter fractures, rupture of fixation points, and others) and systemic complications (infections, thrombosis, embolisms, and others).

Proper labelling of CVC lumens according to their use and verification of patency.

Dressing of the puncture site and catheter insertion site and, above all, verification of the fixation of the central venous catheter according to institutional standards.



Recording of the procedure, including the date, time of initiation and, above all, the name of the responsible staff member.

Frequency of evaluation

Evaluations should be carried out as necessary and, above all, according to the frequency of total parenteral nutrition prescriptions available in each service, since there are services where TPN is used more frequently than in other areas or other health institutions. This frequency can be monthly or, depending on the need, this time may be shorter or longer.

Measurement tools

As a specific tool or method, a checklist of compliance with various parameters can be applied during the TPN preparation and administration process, which will serve to average the level of compliance with this protocol.

8. Ethical and legal considerations

Ethical aspects

Informed consent: Generally, most healthcare institutions, whether public or private, have some form of internal informed consent form that can be signed by the patient before the start of total parenteral nutrition. although there is no standardised form from the Ministry of Public Health, it is the duty of healthcare personnel to inform the patient of the procedure to be adopted to improve their health, either to the patient if they are conscious or to the family if the patient is not physically or mentally capable of signing it. Information will be provided on the procedure, benefits, possible complications, and their autonomy to make decisions regarding their current condition will be respected, since life is unique and valuable and therefore the principle of non-maleficence must be upheld regardless of the type of patient we are dealing with (28).



Confidentiality: Healthcare personnel must provide and guarantee the privacy and confidentiality of patient information at all times, including all procedures performed and treatments administered, in accordance with legal regulations relating to both the protection of personal data and the confidentiality of the information contained in the patient's medical records (29).

Legal aspects: Compliance with applicable local or national regulations, standards and policies.

9. Contingency Plan and Complication Management

Identification of possible complications

Loss of sterility during the preparation of TPN, especially if there is no specific and adequate area for this purpose, such as a laminar flow hood.

Contamination and precipitation of the solution due to incorrect addition of TPN components, either due to lack of knowledge or lack of time due to the workload and multiple activities that nursing staff must perform during a shift. Or, depending on the area, the multiple TPNs that must be prepared.

Lack of professional nursing staff, due to the fact that in most healthcare institutions, nursing staff is always insufficient to meet the high demand of patients in the vast majority of healthcare centres. As a result, when special procedures such as these are performed, due to the time required, they end up being performed mechanically, losing the scientific basis and established standards for them (30).

Protocol for action in the event of complications

First, immediately notify someone if sterility is lost, as continuing with the procedure involves a risk of contamination and additional complications for the patient.

Second, discard the preparation, as it is no longer safe, and request new doses to start a new preparation.



Third, establish a specific place to be used only for this function, preferably with the appropriate conditions for the preparation of these solutions according to the possibilities of each healthcare institution. The exclusive use of a laminar flow hood is recommended.

Fourth, request professional nursing staff and assign them to perform this task according to the needs of the healthcare institution, so that the conditions, time and established protocol are complied with and thus avoid errors due to pressure.

Rotate this personnel periodically to ensure that all nursing staff are trained and involved in this activity.

Finally, provide regular training and evaluation to identify and correct any deficiencies (31).

10. Evaluation and Continuous Improvement

Periodic review of the protocol

This protocol should be reviewed at least once a year in each healthcare institution, using the information obtained from the checklists, which should be consolidated and will give us an idea of the weak points that need to be reinforced. At the same time, this will serve to update the information with new ideas, forms or methods of learning to improve the compliance rates obtained each year.

Updating the content

Monthly reports on the evaluations carried out should be prepared. This information will be used to produce an annual summary of the information in order to develop a report on the results obtained and design new teaching methods or provide feedback to the healthcare team based on the evidence obtained, thereby addressing the issues where the most errors or deficiencies are found.

12. Annexes and appendices



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EVALUATION QUESTIONS			
PREPARATION OF PARENTERAL NUTRITION	Yes	No	Sometimes
Have the prescribed medical indication card available and verify that the information transcribed for preparation matches the medical prescription.			
Prepare all the necessary equipment to begin preparing the NP, which will be transported to the laminar flow hood or area designated for this procedure.			
Prepare the area and disinfect it to ensure it is sterile before starting the procedure.			
Wash your hands before starting the procedure.			
Protective and safety clothing is put on in the correct order and in compliance with aseptic measures and biosafety standards, keeping the area sterile and avoiding contamination.			
Carry out the procedure following the order and quantities indicated for each prescribed medication, and the safety and sterility measures governed by the established protocol.			
I rigorously apply all necessary and appropriate aseptic techniques during the initiation and establishment of the infusion set circuit.			
Classify waste according to the biosafety standards established by the health institution.			
Hand washing was performed once the NPT preparation procedure was completed.			
I maintain the principle of sterility of the NPT prepared during transport until it is connected to the patient.			
ON THE ADMINISTRATION OF TOTAL PARENTERAL NUTRITION TO THE PATIENT	Yes	No	Sometimes
Prepare and transport the necessary equipment to the patient's room for connecting the NPT.			
Explain the procedure to be performed and the benefits to be gained, as well as possible complications, including warning signs that may arise for the patient and family, using clear and understandable language before connecting the NPT.			
Take vital signs and check blood glucose levels prior to connecting the NPT.			
Hands are washed before starting to connect the NPT.			
I verified the proper labelling of the CVC lumens according			



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Isabel Cristina Mesa-Cano

to their use and checked their patency.			
Check for local signs of complications at the CVC insertion site, such as bleeding, signs of infection, fluid extravasation, date of placement, and healing before connection.			
Disinfect the catheter connector or three-way stopcock with an antiseptic solution before connecting the catheter to the infusion equipment.			
Maintain strict aseptic techniques during the installation of the catheter-sheath circuit and infusion equipment, checking that the stopcocks or access points are closed to prevent solution leakage or blood return, as appropriate.			
Use the exclusive venous line or lumen for TPN administration.			
Check that the solution in the bag is the one previously prepared and, above all, that it is free of precipitates.			
Program the infusion pump according to medical instructions, with the total volume and time to be infused.			
Wash hands after completing the procedure.			
Place the card with the information on the contents of the TPN, as well as general information on the patient, such as name, medical history, type of solution being administered, date, time, total volume, infusion rate, and name of the person responsible for both preparation and administration.			
Once the infusion has started, check for side effects or adverse reactions.			
Provide comfort and convenience to the patient before leaving the room.			

Responsible:

Source: Data compiled in the study conducted by the author.

Diagrams or charts

NUTRICIÓN PARENTERAL



NUTRICIÓN PARENTERAL CENTRAL O TOTAL

- Acceso venoso central de gran calibre
- Concentraciones más altas de macronutrientes en comparación con los vasos periféricos
- Menor riesgo de tromboflebitis o daño a los vasos

Es posible administrar **todos los requerimientos energéticos y proteicos** que precise el paciente

 **Necesidad de nutrición parenteral prolongada**

NUTRICIÓN PARENTERAL PERIFÉRICA

- Acceso venoso periférico
- Necesidades calórico-proteicas limitadas
- Alta tasa de flebitis

Se utilizará esta vía en el preoperatorio inmediato, postoperatorio, como complemento de NE y si no se dispone de vía central adecuada

Concentración **máxima de 900 mosm / L**

 **Menos de 7 días**

VYON

 Imposibilidad de ingerir o absorber nutrientes en el aparato digestivo

 Desnutrición grave e intestino no funcional

 Radioterapia/ quimioterapia con desnutrición e imposibilidad de alimentación por otra vía

 Pancreatitis necrohemorrágica con imposibilidad o intolerancia a la nutrición enteral

 Catabolismo grave sin poder utilizar el aparato digestivo en 5-7 días

 Obstrucción o hemorragia digestiva prolongada

Source: Adapted from Campus Vygon 2020 (32)

CONCLUSION



In writing this article, I have concluded that all nursing staff must be much more involved in the preparation of total parenteral nutrition, but above all in demonstrating this involvement, since, although it is true that the role of nursing is essential, given that in many healthcare institutions nursing staff are responsible for both the preparation and administration of parenteral nutrition, often without the appropriate conditions to maintain the necessary sterility, they nevertheless adapt to the needs. However, as we can see from the scientific evidence in articles and most books, the only published evidence, or at least the majority of it, comes from doctors, biochemists or even nutritionists, when in very few institutions are they responsible for this.

For this reason, I believe it is very important to highlight our work with publications, studies and percentages that demonstrate our reality within the healthcare system. As nurses, we are trained in both scientific theory and practice to carry out this activity. We have been doing it for years, but we have not been given the importance or visibility that we should have as part of the medical team, and we as a profession have not done so either, and if we have, it has been very few people.

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CONFLICT OF INTEREST

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REFERENCES



1. Eriksen MK, Crooks B, Baunwall SMD, Rud CL, Lal S, Hvas CL. Systematic review with meta-analysis: effects of implementing a nutrition support team for in-hospital parenteral nutrition. *Alimentary Pharmacology & Therapeutics* [Internet]. 2021;54(5):560-70.
2. Ridley EJ. Parenteral nutrition in critical illness: total, supplemental or never? *Current Opinion in Clinical Nutrition & Metabolic Care* [Internet]. 2021;24(2):176-82.
3. Ángeles Márquez M, Aisa Álvarez A, Aguirre Sánchez JS, Martínez Díaz BA, Montaña Jiménez A. Estudio de cohorte para evaluar la asociación entre el tiempo de inicio de nutrición con días de ventilación mecánica invasiva en pacientes con choque séptico. *Medicina crítica (Colegio Mexicano de Medicina Crítica)* [Internet]. 2023;37(2):82-7.
4. Wanden-Berghe C, Pereira Cunill JL, Cuerda Compes C, Ramos Boluda E, Maiz Jiménez MI, Gómez Candela C, et al. Nutrición parenteral domiciliaria en España 2017. Informe del Grupo de Nutrición Artificial Domiciliaria y Ambulatoria NADYA. *Nutrición Hospitalaria* [Internet]. 2018;35(6):1491-6.
5. Al-Dorzi HM, Arabi YM. Nutrition support for critically ill patients. *Journal of Parenteral and Enteral Nutrition* [Internet]. 2021;45(S2):S47-S59.
6. Epp L, Blackmer A, Church A, Ford I, Grenda B, Larimer C, et al. Blenderized tube feedings: Practice recommendations from the American Society for Parenteral and Enteral Nutrition. *Nutrition in Clinical Practice* [Internet]. 2023;38(6):1190-219.
7. Tramonti N, Lema J, Araujo MB, Basílico H, Villasboas RM, Laborde S, et al. Results of the implementation of a nutritional support protocol for major burn pediatric patients hospitalized in the intensive care unit. *Arch Argent Pediatr* [Internet]. 2018;116(4):e515-21.
8. Groh-Wargo S, Barr SM. Parenteral nutrition. *Clinics in Perinatology* [Internet]. 2022;49(2):355-79.
9. Hill A, Elke G, Weimann A. Nutrition in the intensive care unit—a narrative review. *Nutrients* [Internet]. 2021;13(8):2851.
10. Madnawat H, Welu AL, Gilbert EJ, Taylor DB, Jain S, Manithody C, et al. Mechanisms of parenteral nutrition—associated liver and gut injury. *Nutrition in Clinical Practice* [Internet]. 2020;35(1):63-71.
11. Berlana D. Parenteral nutrition overview. *Nutrients* [Internet]. 2022;14(21):4480.
12. Lázaro Cebas A, Pablos Bravo S, Gomis Muñoz P, Orbaneja MÁ, Spiers S, Shinn M, et al. Límites de precipitación en nutriciones parenterales pediátricas con fuentes de calcio y fosfato orgánicas. *Nutrición Hospitalaria* [Internet]. 2018;35(5):1009-16.



13. Bonet A, Grau T. Estudio multicéntrico de incidencia de las complicaciones de la nutrición parenteral total en el paciente grave: Estudio ICOMEP 1ª parte. *Nutrición Hospitalaria* [Internet]. 2005;20(4):268-77.
14. Orejana Martín M, Cornejo Bauer C, Torrente Vela SA, García Fuentes C, López López C, Montejo González JC. Eficacia del aporte calórico en pacientes con patología traumática. *Nutrición Hospitalaria* [Internet]. 2018;35(6):1257-62.
15. Boullata JI, Mirtallo JM, Sacks GS, Salman G, Gura K, Canada T, et al. Parenteral nutrition compatibility and stability: a comprehensive review. *Journal of Parenteral and Enteral Nutrition* [Internet]. 2022;46(2):273-99.
16. Feinberg J, Nielsen EE, Korang SK, Engell KH, Nielsen MS, Zhang K, et al. Nutrition support in hospitalised adults at nutritional risk. *Cochrane Database of Systematic Reviews* [Internet]. 2017;(5).
17. Gill PJ, Anwar MR, Kornelsen E, Parkin P, Mahood Q, Mahant S. Parenteral versus enteral fluid therapy for children hospitalised with bronchiolitis. *Cochrane Database of Systematic Reviews* [Internet]. 2021;(12).
18. Sowerbutts AM, Burden S, Sremanakova J, French C, Knight SR, Harrison EM. Preoperative nutrition therapy in people undergoing gastrointestinal surgery. *Cochrane Database of Systematic Reviews* [Internet]. 2024;(4).
19. Prado RA, Márquez HA, Moya DA. *Nutrición enteral y parenteral*. McGraw-Hill Interamericana; 2012.
20. Vial Larrain B, Soto Pino I, Figueroa Ramírez M. *Procedimientos de enfermería medico-quirúrgica*. Santiago de Chile: Mediterráneo LTDA; 2007.
21. Hamdan M, Puckett Y. *Total parenteral nutrition* [Internet]. 2020.
22. Gómez-Costas D, Romero-Jiménez RM, Lobato-Matilla ME, Culebras R, González JA, Herrero-Bermejo S, et al. Detection and reduction of errors in parenteral nutrition compounding through gravimetric and product control. *Farmacia Hospitalaria* [Internet]. 2024;48(3):116-21.
23. Parra-Flores M, Souza-Gallardo LM, García-Correa GA, Centellas-Hinojosa S. Incidence of infection associated with central venous catheter and related risk factors in patients on total parenteral nutrition in a third level hospital. *Cirugía y Cirujanos (English Edition)* [Internet]. 2017;85(2):104-8.
24. Pelluz CS, Pastor JP, Moya EN, Picó JN, Quintana S. Predictive factors of hyperglycaemia in patients with parenteral nutrition. *Medicina Clínica (English Edition)* [Internet]. 2020;154(5):157-62.
25. Lynn PB. *Enfermería clínica de Taylor*. Wolters Kluwer; 2017.
26. Xu Y, Fei XY, Xue YH, Wang XM, Wang XY, Zheng YT, et al. Chinese expert consensus on the nursing management of the totally implantable venous access device. *Journal of Cancer Research and Therapeutics* [Internet]. 2022;18(5):1231-40.



27. Yust-Muñoz S, Zarandona-Calvo J, Arrúe-Mauleón M, Gravina-Alfonso L. Enseñanza y aprendizaje sobre nutrición en estudiantes de enfermería: revisión de alcance. *Enfermería Global* [Internet]. 2023;22(70):522-54.
28. Sayers GM, Lloyd DAJ, Gabe SM. Parenteral nutrition: ethical and legal considerations. *Postgraduate medical journal* [Internet]. 2006;82(964):79-83.
29. Saleem SG, Ali S, Ghouri N, Maroof Q, Jamal MI, Aziz T, et al. Patient perception regarding privacy and confidentiality: A study from the emergency department of a tertiary care hospital in Karachi, Pakistan. *Pakistan Journal of Medical Sciences* [Internet]. 2022;38(2):351.
30. Lopez-Delgado JC, Grau-Carmona T, Mor-Marco E, Bordeje-Laguna ML, Portugal-Rodriguez E, Lorenzo-Cardenas C, et al. Parenteral Nutrition: Current Use, Complications, and Nutrition Delivery in Critically Ill Patients. *Nutrients* [Internet]. 2023;15(21):4665.
31. JM MV, Terradillos I. Complications of pediatric parenteral nutrition. *Nutricion Hospitalaria* [Internet]. 2017;34(Suppl 3):55-61.
32. Pérez Martínez J. ¿Qué importancia tiene la exactitud y la precisión en los métodos de monitorización hemodinámica? [Internet]. Campus Vygon; 2021. Disponible en: <https://campusvygon.com/es/author/jperez/>

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