ORIGINAL ARTICLE

# Nursing professionals' knowledge about erythropoietin*

## CONOCIMIENTO DE LOS PROFESIONALES DE ENFERMERÍA SOBRE LA ERITROPOYETINA

## CONHECIMENTO DOS PROFISSIONAIS DE ENFERMAGEM SOBRE A ERITROPOETINA

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**ABSTRACT**

This study was performed with the objective to evaluate the knowledge that nursing professionals have about the process of preserving, preparing and administering erythropoietin (EPO). This exploratory, descriptive study used a quantitative approach. It was performed at a Dialysis Center, from January to March 2009, and consisted on applying a questionnaire to 40 nursing professionals. All ethical aspects were taken into consideration. About the interaction of EPO with the patients' blood pressure, 87.5% had inadequate knowledge; only 32% knew the ideal temperature to preserve the drug, and 52.5% believe that it should be removed from the refrigerator about 15 to 30 minutes before its administration; intravenous administration was the most reported. Among the care before the administration, the most frequent was checking the expiration date; 57.5% used exclusive syringe for the administration and 95% usually register having administered the drug.

**DESCRIPTORS**

Erythropoietin
Nursing
Knowledge

**RESUMEN**

Se objetivó evaluar el conocimiento de profesionales de enfermería sobre el proceso de conservación, preparación y administración de eritropoyetina (EPO). Estudio exploratorio, descriptivo, con abordaje cuantitativo. Realizado en un Centro de Diálisis, con 40 profesionales de enfermería, entre enero y marzo de 2009, utilizando un cuestionario. Los aspectos técnicos fueron considerados. Sobre la interacción de la EPO con la presión arterial, 87,5% posee conocimientos inadecuados; sólo el 32% conocían la temperatura ideal para conservación del medicamento y 52,5% creía que éste debe ser retirado del refrigerador de 15 a 30 minutos antes de la administración; la vía más citada fue la endovenosa. Entre los cuidados anteriores a la administración, la inspección de fecha de vencimiento fue el más frecuente; 57,5 utilizan jeringa exclusiva para administración y 95% acostumbra registrar la administración del fármaco.

**DESCRIPTORES**

Eritropoyetina
Enfermería
Conocimiento

**RESUMO**

Objetivou-se avaliar o conhecimento dos profissionais de enfermagem sobre o processo de conservação, preparo e administração da eritropoetina (EPO). Estudo exploratório descritivo, com abordagem quantitativa. Realizado em um Centro de Diálise, com 40 profissionais de enfermagem, entre janeiro e março de 2009, utilizando um questionário. Os aspectos éticos foram considerados. Sobre a interação da EPO com a pressão arterial do paciente, 87,5% possuem conhecimento inadequado; somente 32% conheciam a temperatura ideal para a conservação do medicamento e 52,5% acreditam que este deve ser retirado do refrigerador de 15 a 30 minutos antes da administração; a via mais citada foi a endovenosa. Entre os cuidados antes da administração, a inspeção do prazo de validade foi o mais freqüente; 57,5% utilizam seringa exclusiva para administração e 95% costumam registrar a administração do fármaco.

**DESCRITORES**

Eritropoetina
Enfermagem
Conhecimento

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## INTRODUCTION

Anemia is a common problem in chronic kidney failure (CKF) patients, caused by blood loss during hemodialysis treatment and patients' inability to synthetize erythropoietin (EPO), a natural hormone healthy kidneys produce, which is responsible for stimulating red blood cell production[1-2].

CKF patients need to use synthetic EPO on a routine base to complete their insufficient production of this hormone and correct their anemia, which can reach severe levels if untreated, reducing their survival and quality of life, causing physical and mental disability and stigmatizing patients in society, as it entails cutaneous pallor, giving them a sick appearance and significantly impairing their social readjustment[3].

In Brazil, according to the 2008 census, it is estimated that more than 80,000 patients are under dialysis and the Northeast corresponds to 19.1% of this total. The Unified Health System (SUS) is responsible for treatment in 87.2% of chronic kidney cases, with hemodialysis as the predominant treatment, in 89.4% of cases. Anemia, characterized by hemoglobin levels below 11g%, affects 41.7% of patients in Brazil. Eighty-three percent of kidney patients use EPO, which State Health Secretaries forward every three months, granting dialysis centers the responsibility to conserve, prepare and administer it[4].

Synthetic EPO is a high-cost drug that demands great care for conservation, preparation and administration purposes. In professional nephrology nursing practice, most dialysis centers do not have a storage, preparation and administration protocol and, moreover, many of them have different routines for these phases.

The nursing team plays a fundamental role in the conservation, preparation and administration of this drug. One single error in any of these phases can cause damage to the patient...

Laboratory recommendations for EPO conservation, preparation and administration are countless, ranging from what temperature to store the drug to the correct application technique[5].

The nursing team plays a fundamental role in the conservation, preparation and administration of this drug. One single error in any of these phases can cause damage to the patient, ranging from side effects until the deactivation of the drug's action, besides financial losses.

All investigated pharmaceutical forms of EPO at use in Brazil receive the same recommendations for conservation, preparation and administration, except for one laboratory with intravenous administration, while the remainder permits both intravenous and subcutaneous administration[5].

It is fundamental to take specific care when handling EPO, such as: verification of expiry date; thermometer maintenance in medication storage refrigerator; inspection of vial content before administration; use of single syringe for medication; withdrawal of drug from the refrigerator according to the manufacturer's recommendation; and vial antisepsis.

Not respecting the asepsis technique can cause infection of the application site as, in most centers, EPO is administered after hemodialysis, directly in the arteriovenous fistula (AVF) needle or in the dialysis catheter, to avoid pricking the patient again.

Before EPO administration, the nursing professional should also confirm the patient's blood pressure, as the drug can increase pressure levels, which may demand medication interventions for blood pressure control during EPO treatment[2].

The nursing team represents the final link in the drug administration process and its actions mark the transition from a foreseeable to a real error. Thus, the guilt for errors tends to affect this team heavily[6-7].

Nursing professionals, although not responsible for drugs prescription, should be familiar with all aspects and phases related to its administration, in order to prevent errors that harm patients.

The high cost of EPO ratifies the relevance of this research, as the problems its misuse and waste cause entail severe damage for the public health system, which provides the dialysis centers with the drug in partnership with the SUS, besides losses due to spending on possible patient hospitalizations, whose disease is aggravated by the misuse.

The goal is to contribute to nephrology nursing practice by exploring professionals' knowledge on EPO, permitting the elaboration of protocols to improve nursing care delivery to chronic kidney failure patients under dialysis.

## OBJECTIVE

To evaluate nursing professionals' knowledge on the conservation, preparation and administration process of EPO.

## METHOD

This is an exploratory and descriptive study with a quantitative approach. The goal of this study is to observe, describe and explore aspects of a given situation, which is of great value to nursing, as it expands knowledge on the research situation or phenomenon. The quantitative approach implies the systematic collection of quantifiable information through conditions of extreme control, including analysis[8].

The research was carried out at a private Dialysis Center in Teresina-PI, which provides hemodialysis to 130 patients on average, mostly in partnership with the SUS. Today, the nursing team comprises three nurses and 38 nursing technicians/auxiliaries.

The population comprised all nursing professionals at the institution, with a sample of 40 professionals. The inclusion criteria were: having worked at least one year in the dialysis area and habitually dealing with erythropoietin. The following exclusion criteria were set: developing activities that did not imply direct patient care and not demonstrating interest to participate in the study.

Data were collected between January and March 2009, using a questionnaire that addressed socio-demographic data and the professionals' knowledge on themes related to the erythropoietin conservation, preparation and administration process. Results were analyzed in terms of absolute and relative frequencies, supported by literature on the theme.

The study was based on Decree 196/96[9], attempting to comply with ethical-legal aspects. Approval for the project was obtained from the Institutional Review Board at *Universidade Estadual de Ceará*. Participants received clarifications on the aims and importance of the research. Participation was voluntary, after signing the informed consent term, which guaranteed anonymity and freedom to drop out at any time.

## RESULTS

Most of the study participants were women (97.5%), between 26 and 40 years (67.5%). Regarding the professional category, most were nursing technicians (87.5%), 7.5% nurses and 5% nursing auxiliaries. Time since graduation ranged between one and thirty years, with 30% having graduated between one and five years earlier. As for experience in dialysis, 50% possessed up to five years of experience.

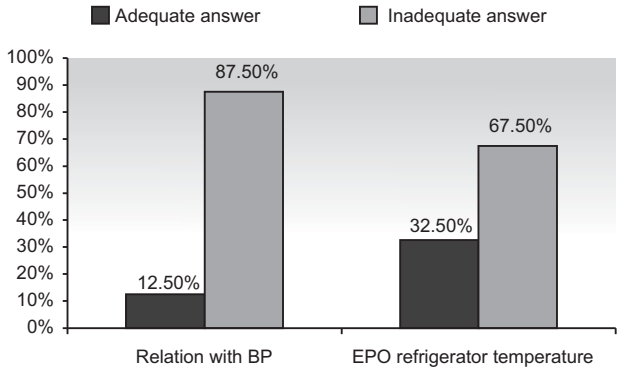


**Figure 1** - Distribution of answers according to relation between EPO and blood pressure and ideal refrigerator temperature - Teresina - 2009

As observed, 87.5% of professionals have inadequate knowledge about the interaction between EPO and patients' blood pressure. Only 32.5% correctly answered the question about the ideal temperature to store the drug.

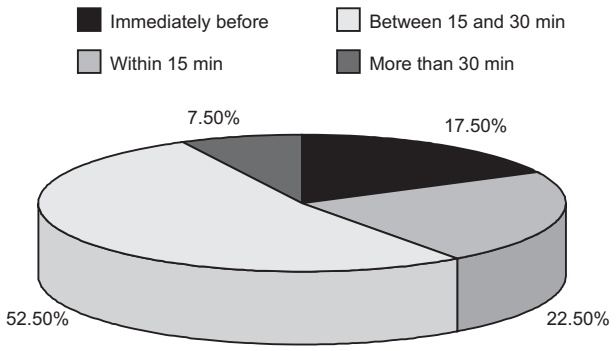


**Figure 2** - Distribution of answers on time considered adequate to remove EPO from the refrigerator before administration - Teresina - 2009

Most of the interviewees (52.5%) believe that EPO should be removed from the refrigerator between 15 and 30 minutes before its administration; 22.5% affirmed that the ideal time is to remove the drug from the refrigerator within 15 minutes before the application and 17.5% consider that it should me removed immediately before its application.

Regarding the administration route, intravenous administration was most mentioned, followed by the subcutaneous and intramuscular route.

**Table 1** - Care participants performed before EPO administration. Teresina - 2009

| Care | N |
|---|---|
| Inspection of expiry date | 28 |
| Confirmation of drug name | 27 |
| Visual inspection of drug | 27 |
| Hand washing | 26 |
| Antisepsis of application site | 14 |
| Measurement of patient's BP | 9 |

Among nursing care before erythropoietin administration, inspection of the expiry date was the most frequent, according to 28 professionals, followed by confirmation of the drug name and visual inspection, which 27 professionals mentioned; 26 professionals indicated that they always washed their hands before administering EPO; 14 affirmed that they always perform antisepsis of the application site and only nine habitually checked the patient's blood pressure.

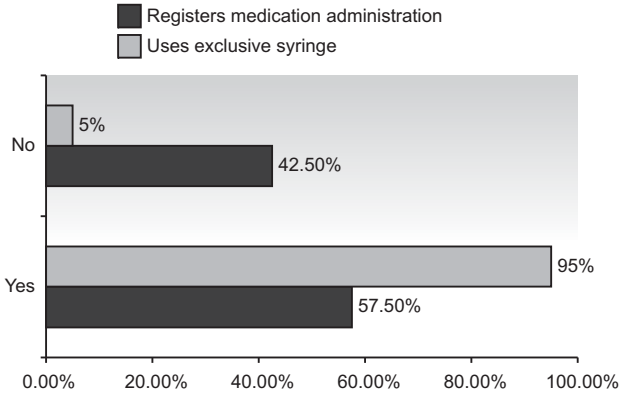


**Figure 3 -** Distribution of answers about syringes used for EPO application and its registration - Teresina - 2009

As shown in the above picture, 57.5% of the professionals use an exclusive syringe for EPO administration, while 42.5% indicated reusing the syringe used for applying other drugs. Ninety-five percent register the drug administration.

## DISCUSSION

Nursing technicians are more frequent among clinical professionals and more involved in EPO administration and handling. This result is justifiable in view of Decree RDC-154, which establishes that dialysis services should offer one nurses for every 35 patients and one nursing technician/auxiliary for every four patients[10]. The result is also compatible with data from the 2008 Census by the Brazilian Nephrology Society[4], which showed a significantly larger number of nursing technicians in dialysis institutions.

Therefore, nursing technicians need to participate in frequent recycling and training courses, as they are directly connected with patient care. Moreover, nurses are responsible for continuous supervision of nursing work, so as to guarantee quality care delivery and efficient EPO administration.

Decree RDC-154 also establishes that nurses working in this area should have a Specialist degree in Nephrology Nursing, as this is a high-complexity service that demands compatible qualification[10].

Data analysis shows that participants started working in the area recently, generally soon after finishing the technical or higher education program.

The job market in nephrology has increased in recent years as a result of the increase in the number of patients and dialysis clinics in Brazil, demanding more professionals. In the last five years, the number of clinics has expanded from 577 in 2003 to 684 in 2007; the number of patients rose from 59,153 to 87,044, entailing a larger job offer and directing nursing professionals towards kidney patient care[4].

In practical dialysis experience, most professionals do not pay attention to EPO's interaction with patients' blood pressure or, to say the least, does not have knowledge on the theme. In most cases, professionals who apply EPO do not take care to measure or investigate the patient's blood pressure before the procedure.

Approximately 80% of CKF patients have a history of systemic arterial hypertension and, during the EPO treatment phase, on average, 25% of CKF patients under hemodialysis may need an increase in antihypertensive drug doses[3,11]. Therefore, it is fundamental for nursing professionals to know about this aspect, as EPO administration can trigger or worsen hypertension.

Among their responsibilities, nursing team members need knowledge about the adverse reactions of the drugs they administer to the patients under their care[12]. Often, however, this team's lack of knowledge is perceived about the side effects and adverse reactions of the drugs[13].

All manufacturers under analysis hegemonically indicate an EPO storage refrigerator temperature ranging between +2 and +8ºC[5]. Not all subjects know this, however, who mostly gave inadequate answers to this question, evidencing a gap in their professional knowledge.

In line with this result, a previous study on nursing workers verified their difficulty regarding the stability of refrigerated drugs[13].

In view of the manufacturers' recommendation and because EPO is a biological drug, just like vaccines, the medication cannot be exposed to environmental temperature and should be administered immediately after its removal from the storage refrigerator. Nevertheless, only 17.5% of professionals answered that the drug should be administered immediately after its removal from the refrigerator, which is concerning, as it can cause patient harm, due to treatment inefficacy, as the medication's exposure to environmental temperature can cause alterations in its action.

The manufacturers also indicate that the drug should not be exposed to light, which ratifies the importance of removing it from the refrigerator immediately before its administration even further[5].

It is important to emphasize that, besides the deficient red blood cell production, chronic kidney patients' anemia is aggravated due to blood loss during hemodialysis sessions, caused by the blood components' adherence to the system used, as well as by accidental volume losses, associated with catheter rupture, system leaks, coagulation and hemolysis.

In this sense, the correct use of EPO can avoid blood transfusions in chronic kidney patients, as it avoids drops in hematocrit levels and the need for additional blood. In kidney patients' anemia management, blood and blood component transfusion is the final treatment option, as it entails immunological sensitivity, infections and iron overload[14].

Before EPO therapy, up to 20% of dialysis patients needed frequent transfusions, accompanied by the risk of

immediate transfusion reactions, viral infections, iron overload and immunological sensitivity. The blood transfusion rate was greatly reduced through the use of EPO therapy[1].

In chronic kidney patients preparing for transplantation, blood transfusion should be avoided, as the immunological sensitivity triggered after the transfusion is an aggravating factor that delays the transplantation, due to greater possibility of transplantation rejection. In case this patient is queuing for a cadaver donor, when the transplantation opportunity can emerge at any time, blood transfusion can discard the opportunity of a transplant.

Professionals in this study preferred the intravenous administration route, followed by subcutaneous administration. It should be highlighted that some participants mentioned the intramuscular route as one of the application options, which means a severe risk of injuring the patient, as this route is inappropriate for EPO, as all laboratories indicate[15].

EPO can be administered through the intravenous or subcutaneous route, the latter of which is preferable, as it presents the best cost-benefit relation. Slow subcutaneous absorption reduces the dose needed to increase hematocrit levels in comparison with the intravenous route. Anyway, the choice of the route for a certain patient depends on pharmacokinetic considerations, in combination with clinical aspects[11].

In nephrology practice, the route nursing professionals most use for hemodialysis patients is intravenous, mainly because it is practical. Kidney patients undergoing hemodialysis have already been submitted to arteriovenous fistula punctures with large-core needles and often refuse a new puncture to use EPO when they find out that intravenous application is also possible, reusing the venous access already established in the AVF.

As for nursing care before EPO administration, the most mentioned was: inspection of expiry date (28); 27 professionals mentioned confirmation of the drug name and visual inspection of the medication; and 26 mentioned hand washing. Fourteen professionals indicated antisepsis of the EPO application site and only nine check patients' blood pressure.

It is important to emphasize the, before administering any drug, nursing professionals should take care to use an antiseptic technique, and also guarantee the validity and characteristics of the drug. Regarding EPO, the patient's blood pressure should also be verified.

A consensus exists in literature about the importance of health professionals' adherence to aseptic techniques, as these are simple and low-cost procedures to reduce infection factors, decreasing their incidence levels[5-7].

The use of an aseptic technique and antisepsis of the application site should be intensified in patients whose immune system is weakened, which is the case of chronic kidney patients, reducing the risk of infection by micro-organisms adhering to the external part of the infusion equipment[16].

Despite special entities' standards and past research, the nursing team does not always adopt prevention measures and care during EPO management and application as, in this study, it was verified that professionals do not take all precautions, which could entail complications for the patient.

Health Department Decree 437 establishes the clinical protocol for anemia treatment. This protocol specifies the criteria for EPO use. Nurses should be familiar with this decree's determinations, as it contains orientations for administration, dosage and side effects related to the use of this drug. Knowing the guidelines for EPO use, nurses should direct and supervise their team with a view correct drug use, decreasing patient damage[12].

In this study, professionals' knowledge was investigated about the use of an exclusive syringe for EPO administration, showing that the majority (57.5%) adopts this care. Nevertheless, a significant part (42.5%) of professionals use the same syringe to apply other drugs.

Erythropoietin should not be diluted or mixed with any other drug, as this can interfere in its action, requiring care to use a syringe exclusively for this drug[15].

Registration is extremely important for EPO treatment control, as the prescribed doses can vary among patients, demanding strict application control to achieve the desired effect. Most participants (95%) took care to register the drug administration. This action is fundamental, as it seems as if a drug not registered in the patient's file was not administered, which can entail severe consequences.

In this context, the importance of nursing supervision should be highlighted, focusing on the nursing team's medication administration records, so as to avoid possible errors by the team. It is common for professionals to postpone medication registration and to end up forgetting about this care[7,17].

## CONCLUSIONS

In view of EPO's complexity, demanding storage and preparation care, it is fundamental for the nursing team to know about these aspects, as well as about essential care to apply this drug.

The study evidenced that nursing professionals do not have sufficient knowledge on this drug. Thus, they do not accomplish the care needed during the preparation and administration process.

One problem perceived is the lack of description on the deadline for using EPO after its removal from the storage refrigerator, in the investigated literature as well as in the manufacturing laboratories' specifications, which limits correct EPO preparation among nursing professionals.

Incorrect EPO administration will cause clinical patient damage, besides putting a burden on the public network,

as this is a high-cost drug. Hence, its use should be optimized in both individual and institutional terms. Nurses at dialysis institutions should know and use anemia treatment and erythropoietin usage guidelines, which should be disseminated to other nursing team members.

Protocols should be put in practice to use this drug in dialysis clinics, under nursing coordination and supervision. After this has been done, nursing professionals should be trained on the job regarding EPO use, emphasizing care with a view to its conservation, preparation and administration.

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