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ADMINISTRAÇÃO DE MEDICAÇÃO INTRAVENOSA NOS HOSPITAIS: CONTRIBUTOS PARA UMA PRÁTICA SEGURA BASEADA NA EVIDÊNCIA

ADMINISTRATION OF INTRAVENOUS MEDICATION IN HOSPITALS: CONTRIBUTIONS TO SAFE EVIDENCE-BASED PRACTICE

ADMINISTRACIÓN DE MEDICACIÓN INTRAVENOSA EN HOSPITALES: CONTRIBUCIONES A LA PRÁCTICA SEGURA BASADA EN EVIDENCIA

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RESUMO

Introdução: A administração de medicação intravenosa pode associar-se a riscos, nomeadamente riscos de infeção, justificando-se a implementação de práticas seguras.
Objetivos: Divulgar as orientações relativas à preparação e administração de medicação intravenosa, em contexto hospitalar; Divulgar as orientações relativas à inserção e manutenção de cateter venoso periférico, em contexto hospitalar; Divulgar a evidência que fundamenta uma prática segura na preparação/administração de medicação intravenosa; Sensibilizar os enfermeiros para uma prática baseada em evidência.
Métodos: Análise de: Recomendações internacionais com foco na preparação/administração de medicação intravenosa e inserção/manutenção de cateter venoso periférico; Desvios à prática segura;
Resultados: Existe evidência que suporta as orientações para a preparação e administração de medicação intravenosa através de cateter venoso periférico, no entanto, vários estudos relatam desvios a essas orientações.
Conclusões: Identificou-se a necessidade de análise das práticas instituídas, a fim de se encontrar estratégias promotoras de mudança, as quais garantam a implementação de práticas seguras na preparação e administração da terapia intravenosa.

Palavras-chave: Segurança do paciente; Enfermagem baseada em evidências; Administração intravenosa; Erros de medicação

ABSTRACT

Introduction: The administration of intravenous medication may involve risks such as infection, and demand the implementation of safe practices.
Objectives: To provide the guidelines regarding preparation/administration of intravenous medication, in a hospital setting; To provide the guidelines regarding insertion/maintenance of peripheral venous catheter, in a hospital setting; To provide evidence supporting safe practice in preparation/administration of intravenous medication; To increase nurses' awareness on evidence-based practice.
Methods: Analysis of: International recommendations focusing on the preparation/administration of intravenous medication and insertion/maintenance of peripheral venous catheter; Deviations from safe practice.
Results: Existing evidence supports guidelines for the preparation and administration of intravenous medication through a peripheral venous catheter; however, several studies report deviations from these guidelines.
Conclusions: We identified the need for analyse of established practices in order to find strategies that promote change, which ensure the implementation of safe practices in the preparation and administration of intravenous therapy.

Keywords: Patient safety; Evidence-based nursing; Intravenous administration; Medication errors

RESUMEN

Introducción: La administración de medicación intravenosa puede asociarse a riesgos, especialmente riesgos de infección, justificándose la aplicación de prácticas seguras.
Objetivos: Difundir las orientaciones relativas a la preparación/administración de medicación intravenosa, en contexto hospitalario; Difundir las orientaciones relativas a la inserción/mantenimiento del catéter venoso periférico, en contexto hospitalario; Difundir evidencia que sostiene la práctica segura en la preparación administración de medicamentos intravenosos; Sensibilizar a los enfermeros para una práctica basada en la evidencia.
Métodos: Análisis das: Recomendaciones internacionales con foco en la preparación/administración de medicación intravenosa e inserción/mantenimiento del catéter venoso periférico; Desviaciones a la práctica segura.
Resultados: La evidencia apoya las orientaciones para la preparación y administración de medicación intravenosa a través de catéter venoso periférico, sin embargo, varios estudios relatan desvíos a esas orientaciones.
Conclusiones: Identificamos la necesidad de análisis de las prácticas instituidas, a fin de encontrar estrategias promotoras de cambio, que garanticen la implementación de prácticas seguras en la preparación y administración de la terapia intravenosa.

Palabras Clave: Seguridad del paciente; Enfermería basada en evidencia; Administración intravenosa; Errores de medicación

INTRODUCTION

The need for quality and safety of health care provision is currently a worldwide concern. The World Health Organization (WHO) several recommendations available on its website address safety as a strategic priority of all institutions in the provision of health care.

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Medication is amongst the numerous therapeutic resources used in health care that must comply with strict safety standards. Safety in the administration of medication is based on specific criteria and can be approached differently. This article addresses intravenous medication (IV) using a peripheral venous catheter (PVC) and emphasizes prevention and control of infection associated with this procedure.

IV therapeutics are very common in hospitalized patients, mostly by PVC. The issued guidelines of the Centers for Disease Control and Prevention (CDC) and the Institute for Safe Medication Practices (ISMP) provide evidence that supports best practices of IV therapeutic procedures. In 2017, the CDC updates the 2011 recommendations 'Guidelines for the Prevention of Intravascular Catheter-Related Infections' and in 2015, the ISMP discloses the document 'Safe Practice Guidelines for Adult IV Push Medications'. Based on the recommendations of these institutions and the study results focused on the IV administration of medication and the use of PVC in hospital settings, the following aim was set:

a) To provide the guidelines for the preparation and administration of IV medication in a hospital setting;
b) To provide the guidelines for the insertion and maintenance of PVC in a hospital setting;
c) To provide evidence supporting safe practices in the preparation/administration of IV medication;
d) To increase nurses' awareness on evidence-based practice.

1. BACKGROUND

Intravenous (IV) medication administration is amongst the most common procedures in hospital settings with a high prevalence of the use of PVC (Alexandrou, E., Ray-Barruel, G., Carr, P. J., Frost, S., Inwood, S., Higgins, N., … Rickard, C. M., 2015). These interventions are usually performed by nurses (Muniz Braga, L., de Oliveira Salgado, P., Chaves de Souza, C., do Prado-Junior, P. P., Cardoso Do Prado, M. R. M., Nakahara Melo, M., & dos Santos Dinis Parreira, P. M., 2018).

The IV route is an easy entrance site for nosocomial microorganisms if one fails to comply with hygiene and asepsis protocols and the use of PVC can lead to several complications, including bloodstream infections (Marsh, Webster, Mihala, & Rickard, 2015; Zingg & Pittet, 2009), an emerging current issue in health care.

On the one hand, the advancements of practices in IV medication preparation and administration are well recognised; on the other hand, the risk of microbiological contamination of drugs and devices need to be carefully questioned and studied. This means that, although IV medication is a common therapeutic resource in health care, there is a lack of supervision and guidance on the related procedures, leading to different practices in institutions and also within the same institution (ISMP, 2015).

In Portugal, the Programme for Prevention and Control of Infections and Antimicrobial Resistance (PPCIRA), of the Health Quality Department of the General Directorate of Health, has issued documents with recommendations that support professionals in adopting evidence-based practices. The PPCIRA Local Coordination Group (GCL-PPCIRA) is responsible for ensuring the implementation of the recommendations in each health institution, as well as carrying out the respective evaluation. Despite the work developed by the CLM-PPCIRA, namely in the dissemination of recommendations, professionals do not always adhere to evidence-based practices. In the specific case of the preparation/administration of IV medication and the insertion/maintenance of PVC, we found that, in several hospital units, the nurses' practices often differ from internal orientations and the guidelines issued by the reference entities, representing potential risks to patient safety. Importantly, there are still no PPCIRA guidelines addressing this particular issue, so each institution is responsible for reviewing the procedures and disseminate them to professionals to promote improvements in practices.

This evidence leads us to stress the importance of disseminating guidelines for safe practices, based on the best empirical evidence and, consequently, on the best quality of health care.

Guidelines for safe practice and underlying empirical evidence

The guidelines for safe practice in the administration of IV medication presented in this article are the result of a synthesis of documents issued by two international reference entities, the Centers for Disease Control and Prevention (CDC) and the Institute for Safe Medication Practices (ISMP).

The CDC is one of the most important operational entities of the United States Department of Health and Human Services and is a global reference for evidence-based practice in health care. The ISMP is an independent, non-profit, non-governmental organization established in 1975 in the United States of America, whose main objective is to promote safety in the use of medicines.

The CDC issued the document 'Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011', updated in 2017 (CDC, 2017) and the '2007 Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings' document, updated in 2019 (Siegel, J. D., Rhinehart, E., Jackson, M., Chiarello, L., and the Healthcare Infection Control Practices Advisory Committee, 2019). These documents include several recommendations supported on different levels of evidence, based on existing scientific data. Also, the CDC web page '*Injection Safety*' (https://www.cdc.gov/injectionsafety/providers.html) provides information and a FAQs section with answers to the most frequently asked questions related to the administration of medical injections.

The ISMP issued the document 'ISMP Safe Practice Guidelines for Adult IV Push Medications' (ISMP, 2015), based on the synthesis of the best available evidence, including clinical articles and other literature, along with the consensus of experts. However, according to the ISMP, there is a paucity of controlled clinical studies related to the administration of IV medication, because of the ethical issues raised concerning the safety of clients.
From the documents provided by the ISMP and the CDC, we selected a set of guidelines regarding the preparation and administration of IV medication and insertion and maintenance of the PVC. This is not an exhaustive but rather a summary of some of the guidelines that we consider a priority when addressing safety in the preparation and administration of medication, particularly related to the prevention of infections. The full consultation of the documents published by the CDC and ISMP will allow a more in-depth knowledge of the subject.
Although the guidelines of the CPC documents are categorized according to the classes of recommendations (I, II, IIa, IIb and III) and the level of evidence (A, B or C), in the ISMP document there are no classes attributed to the recommendations. Therefore, this article does not identify the levels of evidence, nor the classes of recommendations, suggesting the consultation of the CDC documents.

Underlying principles for the preparation of intravenous medication

a) To use an appropriate physical environment (closed doors, no movement of persons, no contact with potentially contaminated products, no draughts);
b) To ensure the conditions to keep hand hygiene/disinfection;
c) To ensure previous disinfection of surface to be used for medication preparation;
d) To ensure the principles of asepsis, in particular in the opening and handling of syringes, needles and bottles;
e) To disinfect the bottle cap or neck (e.g. with 70º alcohol solution) before aspirating the medicine;
f) To use the single-dose bottle solvent to reconstitute/dilute the medication;
g) To avoid unnecessary dilution of medication;

The ISMP highlights the lack of an appropriate location in hospital services for the aseptic preparation of injectable medication as a cross-cutting problem in the various institutions (ISMP, 2015).
There is evidence of the easy and rapid contamination of hospital surfaces (Cobrado, Silva-Dias, Azevedo, & Rodrigues, 2017) and that pathogens survive on surfaces for long periods if these surfaces are not regularly and properly disinfected (Hopman, Donskey, Boszczowski, & Alfa, 2018). This evidence reinforces the need for prior disinfection of the surfaces used in the preparation of the medication.
Some drugs are diluted, despite non-existence of recommendations, creating unnecessary risks (Grissinger, 2017), since dilution adds complexity to the procedure and increases the risk of contamination of sterile drugs (ISMP, 2015). In a sample of nurses who answered a questionnaire on IV therapeutic administration, 83% stated that they diluted the medication before administration and at least half of the respondents reported having used multi-dose bottle solvent (Grissinger, 2017). The use of solvent from a multi-dose bottle should be avoided as it increases the risk of contamination of the solutions. The CDC reports cases of hepatitis B and C virus outbreaks, with one of the identified failures being the use of the same bottle solvent to prepare medication for several patients (Siegel et al. 2019). The existence of outbreaks of infection related to the preparation and administration of injectable medication indicates that some health professionals do not know, do not understand or do not adhere to the basic principles of infection control and aseptic technique (Siegel et al. 2019).
A multicentric study conducted in the United Kingdom, Germany, and France revealed deviations from the principles of asepsis during the preparation of IV medication, particularly in the following items: cleaning of the medication preparation area, hand hygiene, and disinfection of bottles/ampoules (Cousins, Sabatier, Begue, Schmitt, & Hoppe-Tichy, 2005).
There are multiple risks to the patient associated with errors in the preparation of intravenous medication (Schutijser, Klopotowska, Jongerden, Spreeuwenberg, Wagner & de Bruijne, 2018). Several studies identify health professionals' most common deviations, such as not complying with aseptic technique, not performing hand hygiene, not disinfecting the access to the medication bottle or ampoule, amongst others. They emphasize the need to correct these deviations, ensuring greater safety in customer care, and suggest the design and implementation of clinical education programmes and institutional policies aiming to promote adherence to safe practices (ISMP, 2015; Siegel et al., 2019).

Principles underlying the insertion of PVC

a) To disinfect hands:
b) To perform skin antiseptic;
c) To comply with the principles of asepsis when inserting the PVC (aseptic or no-touch technique, namely, do not touch the insertion area after skin antisepsis unless wearing sterile gloves);
d) To apply a sterile dressing to the insertion site, which should be replaced regularly depending on its composition;
e) To secure properly the PVC to avoid potential injury.

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Although the PVC is the most frequent invasive procedure in hospitals, it is often interrupted before the end of treatment, requiring the insertion of a new device (Marsh, N., Webster, J., Mihala, G., & Rickard, C. M., 2015). The PVC is impaired by two circumstances, injury and contamination; its interaction leads to consequences that influence its loss of functionality: infiltration, occlusion/mechanical failure, displacement, phlebitis and infection (Helm, 2019).
The need to improve practices regarding PVC securement is strongly recognized (Marsh et al., 2015). The study conducted by Rickard et al. (2018) identified weaknesses in practices regarding protective dressings and PVC securement, and the authors highlight the need to conduct randomized studies to assess and compare the effectiveness of innovative techniques in this field.
The loss of the PVC functionality is an unacceptable event, emphasizing the need for management of clinically simple practices and easily replicated and economically viable (Helm, 2019). As an example, the implementation of a multimodal strategy resulted in a significant improvement in the maintenance of intravenous catheters and contributed to a decrease in catheter-related bloodstream infection (Freixas, Bella, Limón, Pujol, Almirante, & Gudiol, 2013).
According to the CDC, the periodic evaluation of the knowledge of professionals involved in the insertion and maintenance of intravascular catheters, as well as their adherence to guidelines, is a class IA recommendation (strongly recommended for implementation and supported by well-designed experimental, clinical or epidemiological studies).

Principles to be followed in the administration of IV medication by PVC

a) To disinfect hands before administration;
b) To disinfect the access route (adapter) to the peripheral venous catheter;
c) To evaluate the permeability of the venous catheter, before administration, using a 10cc syringe filled with 0.9% sodium chloride;
d) To administer a solution to wash the adapter/catheter (e.g., 0.9% sodium chloride flush) after administering the medication;
e) To monitor the site of PVC insertion to detect early inflammatory signs.

The access route to the PVC, most commonly the connecter without needle, is easily contaminated with microorganisms of the patient's skin or microorganisms of the surrounding environment, including agents carried by the hands/glove of healthcare professionals.
To reduce the risk associated with IV medication, a protocol for safe administration of injectable drugs was established in hospitals in the Netherlands. However, nurses' adherence to this protocol was reduced both during the initial assessment and after four years (Schutijser, B., Klopotowska, J. E., Jongerden, I., Spreeuwenberg, P., Wagner, C., & de Bruijne, M., 2018). In this multicentric study, one of the parameters in need of improvement is hand hygiene. According to this result, the authors suggest some interventions focused on nurses and adapted to each context (Schutijser et al., 2018). The study conducted by (Oliveira, J. K. A. de, Llapa-Rodriguez, E. O., Lobo, I. M. F., Silva, L. de S. L., Godoy, S. de, & Silva, G. G. da., 2018) hand hygiene was also one of the procedures with the lowest rate of adherence during the administration of IV medication. The disinfection of adapters was another procedure frequently forgotten by nurses (Oliveira et al., 2018).

To analyse current practices

By addressing such a broad theme that includes multiple variables, we assume a perspective of continuous improvement, believing that health professionals, namely nurses, aim to provide better quality and safer care to the recipients of care.
Based on the guidelines of the ISMP, the CDC and the studies' outcomes, and also cross relating with some hospital care settings dynamics, some emerging questions need to be discussed: to what extent do current practices meet the recommendations, particularly concerning the prevention of microbial contamination of medicines and devices used in the preparation and administration of IV medication (e.g., syringes, needles, catheters)? What factors contribute to the deviations from safe practices? To what extent there is a need to change practices? What are the intervention strategies for correcting less safe practices?
We considered that the guidelines presented and the broader documents from which they were extracted need to be analysed by nurses to compare these guidelines with their practices and understand any existing deviations and that may hinder the safety of patients. The intervention of the GCL-PPCIRA (formerly known as the Infection Control Committee) in the review of recommendations, in the training of nurses and the performance of audits of practices, is particularly important. Managers should also analyse the conditions provided to nurses, namely the nurse/patient ratio, safe allocation and time constraints, which may facilitate routine and the consistent reduction of care-related risks.
It is not always easy for nurses to remain faithful to the principles of preparation and administration of IV therapeutics, due to the multiple factor interactions in the daily hospital routine. Concerning the multiple tasks and responsibilities, nurses are faced with the need to establish priorities and develop interventions that may compromise the accuracy of the procedures, namely because of the variables from the contexts that strongly influence practices, for example, the existence or not of materials and devices or adequate spaces, in addition to the professionals' expertise and experience. Shastay (2016) stress that there are variations in the knowledge and skills of professionals about the preparation of IV medication, which can potentially compromise clients' safety.

Several studies identify risk practices and point to the need for intervention (Boyd, Aggarwal, Davey, Logan, & Nathwani, 2011; Cousins et al., 2005; Grissinger, 2017; Schutijser et al., 2018).
The implementation of evidence-based practices is not an easy process, because it implies change. The most frequent response of health professionals to change is indifference or passive resistance (Nielsen, Scildmeijer, Ericsson, Seing, & Birken, 2019). In this sense, it is more likely that the change is accepted if initiated by the professionals or if it depends on their active contribution, and if the need for change is perceived by professionals as well-grounded and properly informed (Nielsen et al., 2019). Therefore, the methodologies to implement evidence-based care should allow for a participatory and multi-professional approach. The groups leading theses processes should carefully consider these factors when planning interventions, as is the case of the GCL-PPCIRA.

CONCLUSIONS

The administration of IV medication may be associated with significant risks to users if professionals are not aware of the potential risks and infection control measures.
Throughout this article, we seek to disseminate the guidelines of two internationally recognized entities, the ISMP and the CDC, and share studies' outcomes, intending to raise awareness among nurses to adopt safe practices in the preparation and IV administration of medicines.
The challenge for nurses is to integrate knowledge into daily practices and monitor these practices, both at the individual level and care teams. The health institution, namely through the intervention of the GCL-PPCIRA, is challenged to review and disseminate the recommendations for IV therapy, based on evidence, providing opportunities for clinical education and auditing of practices, and ensuring feedback to health professionals.
Thus, the active involvement of professionals and institutions as a whole is the key element for IV therapy to evolve to increasingly safe practice and reduce user-related risks.

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