REUFSM
REVISTA DE ENFERMAGEM DA UFSM

UFSM
Rev. Enferm. UFSM - REUFSM
Santa Maria, RS, v. 10, e32, p. 1-17, 2020
DOI: 10.5902/2179769233455
ISSN 2179-7692

Original Article Submission: 02/07/2018 Acceptance: 30/03/2020 Publication: 14/05/2020

Use of the infusion pump in intensive care: perspectives of the nursing team

Uso da bomba de infusão em terapia intensiva: perspectivas da equipe de enfermagem

Uso de la bomba de infusión en cuidados intensivos: perspectivas del equipo de enfermería

Jessika Oliveira Cavalaro[I] , Nadia Raquel Suzini Camillo[II], João Lucas Campos de Oliveira[III], Kelly Cristina Inoue[IV], Andressa Martins Dias Ferreira[V], Laura Misue Matsuda[VI]

Abstract: Objective: to analyze the perceptions of nursing professionals about the use of the Infusion Pump in their daily lives in Intensive Care. **Method:** descriptive-exploratory study, with a qualitative approach, conducted with 15 nursing professionals working in the Intensive Care Unit for Adults of a public teaching hospital in Paraná. Data collection took place in June/2017, through recorded semi-structured interviews, based on the guiding question: could tell me about the use of the infusion pump in your daily work? As for the transcribed data, Content Analysis was employed. **Results:** positive and negative aspects were highlighted regarding the use of the infusion pump, besides general suggestions for its purpose. **Final considerations:** although the interviewees perceive the Infusion Pump as a viable way for the assertiveness in volemic infusion, there are disadvantages related to the drop and alarm sensor. As for suggestions for improvements, it was mentioned the need to optimize the design of the Infusion Pump, especially the alarm programming.
Descriptors: Biomedical Technology; Infusion Pumps; Patient Safety; Nursing, Team; Intensive Care Units

Resumo: Objetivo: analisar as percepções dos profissionais de enfermagem sobre o uso da Bomba de Infusão no seu cotidiano em Terapia Intensiva. **Método:** estudo descritivo-exploratório, de abordagem qualitativa, realizado com 15 profissionais de enfermagem da Unidade de Terapia Intensiva Adulto de um hospital-escola público do Paraná. A coleta de dados ocorreu em junho/2017, por meio de entrevistas semiestruturadas gravadas, pautadas na questão norteadora: poderia nos falar sobre o uso da bomba de infusão no seu cotidiano de trabalho? Aos dados

[I]Nurse. Graduated in Nursing. Holy House Hospital of Maringá, Maringá, Paraná, Brazil, E-mail: jessika.cavalaro@hotmail.com. ORCID: https://orcid.org/0000-0002-4609-217X

[II]Nurse. Master in Nursing. State University of Maringá, Maringá, Paraná, Brazil. E-mail: nadiasuzinicamillo@hotmail.com. ORCID: https://orcid.org/0000-0001-5105-7806

[III]Teacher. Doctor in Nursing. Federal University of Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil. E-mail: joao-lucascampos@hotmail.com. ORCID: https://orcid.org/0000-0002-1822-2360

[IV]Nurse. Doctor in Nursing. University Hospital of Maringá, Maringá, Paraná, Brazil. E-mail: kcinoue1981@gmail.com. ORCID: https://orcid.org/0000-0002-7709-9817

[V]Teacher. Master in Nursing. State University of Maringá, Maringá, Paraná, Brazil. E-mail: andressam_dias@yahoo.com.br. ORCID: https://orcid.org/0000-0002-8020-9773

[VI]Teacher. Doutora em Enfermagem. State University of Maringá, Maringá, Paraná, Brazil. E-mail: lauramisuem@gmail.com. ORCID: https://orcid.org/0000-0002-4280-7203

transcritos, empregou-se a Análise de Conteúdo. **Resultados:** foram pontuados aspectos positivos e negativos acerca do uso da bomba de infusão, além de sugestões gerais ao seu propósito. **Considerações Finais:** apesar dos entrevistados perceberem a Bomba de Infusão como viabilizadora da assertividade na infusão volêmica, existem desvantagens relacionadas ao sensor de gotas e alarme. Como sugestões de melhorias, referiam necessidade de otimizar o *design* da Bomba de Infusão, especialmente a programação de alarmes.
Descritores: Tecnologia Biomédica; Bombas de Infusão; Segurança do Paciente; Equipe de Enfermagem; Unidades de Terapia Intensiva

Resumen: Objetivo: analizar las percepciones de los profesionales de enfermería sobre el uso de la Bomba de Infusión en su vivir cotidiano en Cuidados Intensivos. **Método:** estudio descriptivo-exploratorio con enfoque cualitativo, realizado con 15 profesionales de enfermería de la Unidad de Cuidados Intensivos para Adultos de un hospital público de enseñanza en Paraná. La recopilación de datos ocurrió en junio/2017, mediante entrevistas semiestructuradas grabadas, basadas en la pregunta orientadora: ¿podrías contarme sobre el uso de la bomba de infusión en su trabajo cotidiano? Para los datos transcritos, se empleó el Análisis de Contenido. **Resultados:** se señalaron aspectos positivos y negativos acerca del uso de la bomba de infusión, además de sugerencias generales para su propósito. **Consideraciones finales:** aunque los entrevistados perciben que la Bomba de Infusión es viable para la asertividad en la infusión volémica, existen desventajas relacionadas con el sensor de gotas y alarma. Como sugerencias de mejoras, se mencionó la necesidad de perfeccionar el *design* de la Bomba de Infusión, especialmente la programación de alarmas.
Descriptores: Tecnología Biomédica; Bombas de Infusión; Seguridad del Paciente; Grupo de Enfermería; Unidades de Cuidados Intensivos

Introduction

In Intensive Care Units (ICU), technology management makes care more complex, since management must be coupled with knowledge about each device that integrates intensive care, such as: ventilators, infusion pumps, monitors and dialysis machines.[1] In this scenario, inappropriate use, whether due to team or equipment failures, can cause adverse events, whose prevention is one of the responsibilities of the team involved, including nursing professionals.[2] Following the example of the previous assumption, research with nurses in the ICU of a university hospital in Rio de Janeiro found slips, lapses and mistakes, mainly when operating Infusion Pumps (IP) and Monitoring Systems.[3]

IP is an electromedical device that, through positive pressure, generates and regulates the flow of solutions administered to the individual.[4] For this purpose, it has a command screen and an alarm system, which allow greater accuracy and safety in the infusion of parenteral or enteral solutions, indicated during the treatment of the patient.[4-7] IPs have as main function the

continuous administration of drugs that have the threshold between their therapeutic action and toxicity very close, which in presentations of pills and/or simple injections would bring oscillations between their concentration over time in the body of the individual receiving such therapy. Therefore, its use allows greater infusion control and, consequently, greater efficacy in patient therapy – ensuring the safety of medication administration.[5]

The inappropriate use of IP is associated with the lack of knowledge of the professional with respect to its operation, the deficiency of communication among the multidisciplinary team members and, also, the lack of attention at the time of preparation and/or the excessive workload.[8-9] In this sense, the variety of IP manufacturers and models is an important aspect to be considered, since there is variation in the pump interface (analog or digital), form of flow control (volumetric and non-volumetric flow), organization of the control panel and data output, as well as infusion mechanism (peristaltic or rotary peristaltic), which can contribute to the induction of errors in the operationalization of this technological apparatus.[3]

It is suggested, therefore, that research about the use of IP by nursing professionals is scientifically relevant because it deals with the use of technology in patient care; and, in view of this activity, it is inherent to the safe administration of medications, which, in turn, corresponds to the third global challenge for patient safety, launched by the World Health Organization (WHO) in the year 2017.[10] Accordingly, it is expected that the results of this research may contribute to the improvement of the quality of health care, besides subsidizing the construction of new knowledge about the topic addressed in the colleges of the health area, in the services or in the production of such equipment.

Given the importance of investigating the understanding of these professionals about the use of IP as an alternative to improving care, this study is underpinned by the research question: how do nursing professionals perceive the use of IP in their work in Intensive Care?

In order to resolve this question, this study was intended to analyze the perceptions of nursing professionals about the use of the Infusion Pump in their daily lives in Intensive Care.

Method

Descriptive-exploratory research, with a qualitative approach, conducted with nursing professionals working in the ICU for Adults (ICU-A) of a public teaching hospital, reference for medium and high complexity. The ICU-A in question has 8 beds and a nursing team composed of 17 nurses and 20 nursing technicians. Regarding the technologies available for health care services, this unit has resources required by specific legislation,[11] including medical IP, enteral diet IP and syringe pumps. Volumetric IP was the focus of this study because, in the institution under investigation, this is the model used.

Nursing workers were invited to take part in the research, regardless of the professional category (nurses and nursing technicians), those who met the selection criteria were: working in the ICU-A for at least one year and having a statutory employment bond with the hospital.

Data were collected in June 2017, through the delivery of an invitation letter to the Head of Nursing, in order to introduce the study proposal. After obtaining institutional authorization, a survey of eligible participants was carried out. Subsequently, nursing professionals were contacted for invitation and clarifications about the research and, through prior informal acceptance, the data collection schedule was agreed, and the semi-structured interview was performed.

The meetings took place individually, on a date, time and place agreed with each professional, according to his/her own indication. On that occasion, the objective of the study and the data collection process were reiterated to the participant, in such a way as to obtain the formal acceptance of the participant, by reading and signing the Free and Informed Consent Form in two copies of equal content.

At the beginning of each meeting, the participant was asked to fill out a sociodemographic and labor form, thereby proceeding to the interview with audio recording and oriented by the guiding question: "could tell me about the use of the infusion pump in your daily work?". The number of respondents was delimited based on the scope of the research purpose. For this purpose, it was used as criterion the successive repetition of the emitted content (speeches) by the participants.[12]

The recordings were transcribed in full, with orthographic adequacy; and, in all the emitted reports, the Content Analysis method was applied, in the thematic mode, proposed by Bardin, which states that this method consists of a set of analytical techniques, carried out through systematic and objective message description procedures, which make it possible to infer knowledge hidden by means of these messages.[13]

In the presentation of the results, the excerpts/speeches/verbatims were edited without interfering in their content, followed by the codification of the respective participant, which took place by the designation of the letter "E" – corresponding to the word "*Entrevista*", i.e., "Interviewee" translated into Portuguese language – and Arabic numbering sequential to the transcription of the interviews (E1, E2, E3, [...] E15). This study was attended by eight nurses and seven nursing technicians, who answered a semi-structured questionnaire with six questions previously written by the author. It fully complied with the legal and ethical requirements in force[14] and received a favorable opinion on 01/24/2017, with nº 3939/2016, issued by the Research Ethics Committee Involving Humans of the State University of Maringá and CAAE nº 64089117.3.0000.0104.

Results

The participants had an average age of 42 years; with a predominance of females (n=13); working time in the investigated ICU ranging from 2 years (minimum) to 20 years (maximum) and; schooling that ranged from technical level to doctorate degree.

From the content of the interviews, one can highlight the positive and negative aspects about the use of the infusion pump and suggestions to optimize its handling.

As for the positive aspects of the infusion pump, it was considered an indispensable resource for the maintenance of the lives of patients, as it allows the controlled infusion of almost all drugs administered in the ICU-A:

> *[...] thinking about intensive therapy without an infusion pump is very complicated, because there would have to be total control, there are many medications and it really is a great help in our work.* (E5)

> *[...] the infusion pump is our work material, we depend on it because, in a critical patient, it's everything, as he needs continuous infusion [...] we deal with many vasoactive drugs, we have to make an infusion in a precise time, precise dripping. That's why it is an indispensable work tool.* (E1)

When analyzing the excerpts, the benefits provided by IP regarding agility and accuracy were also mentioned, which favor the performance of daily activities, in addition to patient safety:

> *You can infuse the right volume, program the right volume [...] you know you are going to infuse everything just right, so you can see how long this medication will last, in order to make another one ready.* (E7)

> *[...] in relation to the reduction of nursing work and, mainly, in patient safety, what is being infused is extremely important. Above all, when it comes to an ICU, where medications need to have accurate dripping and you need to make sure this is really happening.* (E14)

Some participants reported the way in which the ICU everyday life would run if the infusion pump was not possible:

> *If it were manual, there would be surely a risk that [the medication] could be infused too much or too little because nursing staff would not have time to be accurately taking care of all patients and all medications [during infusion].* (E12)

> *[...] manually it would be much more complicated, although we know that there is variation from pump to pump, according to the equipment. However, with the certainty that the chance of error is much less than manual control.* (E14)

> *[...] before I had to count the drops and, in practice, the actual dripping count was not made [...] it was usually made in the 'achômetro', that is, impromptu. There was no accuracy [...] we lost a lot as a professional and also wasted time to see if [the dripping] was too fast or too slow.* (E15)

Although positive aspects have been pointed out regarding the use of IP in the ICU environment, the interaction with technology is also permeated by negative aspects, which can represent barriers or limitations.

Concerning the negative aspects observed during the use of IP, among the difficulties related to its use, it was understood that, for some participants, the drop sensor cable of this equipment constitutes obstacles to the organization of the *box* in which the patient is hospitalized. In addition to this aspect, the volume of the audible alarm system was also highlighted as fragility.

With respect to the drop sensor cable, the respondents highlighted the difficulty of physically organizing the equipment close to the patient, as well as handling the infusion system:

> *I don't like the pump sensor [...] it hampers our lives! It is a coiled wire, which, sometimes, gets tangled in supports, in the equipment and so on. Therefore, the only thing I don't like is the pump sensors, it's very complicated.* (E4)

> *[...] and another thing that I think it's past time to solve is the issue of sensors [of the infusion pump]. They are very poor, as if they were telephone cables, it's horrible! It makes it difficult for us to organize [the box]. It makes the box messy [...]. The sensors hit each other.* (E5)

Still regarding the drop sensor, the difficulty of cleaning was also highlighted:

> *[...] cleaning is hard; the sensor has recesses [...]. A sensor used in a patient with KPC, for example, has to be sent to oxide* [sterilization carried out outside the hospital]*, because you can't clean it properly. It looks like a phone cable* (E7)

With regard to the alarm system triggered by IP, the participants consider that it causes excessive noise in the unit:

> *The noise inside an ICU, with many patients and many pumps, sometimes goes beyond and we know that there are studies [on noise level] that say it is harmful [for health].* (E14)

> *Its sound [from IP] in the ICU makes us crazy every now and then, because it's not a low sound [...] you can't keep [the alarm] low and when the bomb alarm sounds, it usually starts behind the another one [...] and you have to run away because the device is noisy!* (E8)

When explaining their considerations about the use of IP, the speeches moved between positive and negative aspects, permeated by optimization strategies for the handling of this equipment.

Finally, the suggestions to optimize the handling of IP are linked to measures that can mitigate or even solve the difficulties related to the drop sensor and the alarm system.

Despite the criticism, the drop sensor cable of the infusion pump obtained few suggestions for improvement, and these are related to its design:

> *[...] I would change the pump design, put a straight [cable] wire, not a spiral.* (E4)

> *[...] mainly the [brand], I think it's very large and spacious, even though I can overlap them [...]. Perhaps if they [the bombs] were smaller, as they occupy a big space!* (E11).

With regard to the alarm system, the participants perceive that the increase in the volume control of the audible alarm and the possibility of changing the sound pattern facilitate the nursing work in the ICU environment:

> *I think it was possible for [the alarm] to sound calmly. It could play and stop [...]. It could have the option to lower the alarm.* (E13)

> *A suggestion would be to control the volume [...] because some alarms are very high and the pump does not have this control; if it has, we do not find out; I think it could have this [...] the alarm is annoying, but it is necessary, you can't take it out [...] but it could be lower.* (E15)

> *It would be better if the alarms of one box were different from the other [...] it would be easier to know where the right IP is located. Therefore, you would have greater efficiency to locate the pump [...]. We need three or four more types of sounds [alarm] because the thing is sinister!* (E8)

> *We put on antibiotics and, after half an hour, all the pumps play the alarm; and if there is a vasoactive drug there in the middle [of the infusion], we end up ignoring or even losing it. Therefore, if there was a different alarm for the drug, we could identify more quickly and act more where it is a priority.* (E15)

In the testimonies, there were not only suggestions regarding the problems signalized as negative aspects during the use of the infusion pump. The participants also made the following suggestions for a better functionality of the equipment:

> *[...] pump that could also infuse blood.* (E5)

> *The pumps that we use to infuse serum could have the function of programming to work on time, without any necessity for us to go there and turn it on again. It's a matter of leaving it programmed.* (E7)

> *[...] my suggestion, despite knowing that it is possible, is to modify the KVO flow rate* [Keep Vein Open or maintenance of the open vein]*. In practice, we do not do this because we need to send it to the factory [*reprogramming*], but it would be very useful if everyone could control this time according to their place of work, the characteristic of the unit, etc.* (E14)

In summary, the suggestions were directed to the resolution of problems experienced daily by nursing professionals working in ICU-A.

Discussion

Infusion pumps were strongly incorporated into the ICU everyday life, mainly due to their accuracy in the infusion of drugs and liquids used in the treatment of critical patients who, due to their complexity and vital instability, demand greater exactitude in the administration of solutions.[7] This assumption was strengthened by the statements of nursing professionals when they depicted positive aspects of the use of IP.

In the excerpts shown, we can note how IP is directly related to the patient safety issues and the favoring of nursing work conditions. This fact contrasts with a study carried out in the Intensive Care Center of a hospital belonging the Brazilian Network of Sentinel Hospitals, where inadequate handling of IP was identified, by silencing the audible alarm even when this device warns on the completion of the solution, besides delaying in responding to the alarm.[9]

In the ICU environment, there are multiple drugs necessary for the treatment of critically ill patients, most of them intravenously.[15] In this regard, the need for rigorous control during the administration of vasoactive drugs was highlighted, which are indicated to restore adequate blood circulation, thereby reinforcing the statement that the consequences of incorrect or excessive doses of medicines may be catastrophic and even lethal for the patient.[16]

Another positive aspect corresponded to the possibility of foreseeing the completion of the solution in infusion, which certainly contributes to the process of planning and organizing nursing care in the ICU environment, in order to ensure that drugs of continuous infusion do not have their flow interrupted, since that advanced care held in intensive care would not be possible without such high-tech equipment, thereby being seen as an important mechanism as much as the nursing workforce.[1]

Nevertheless, although the use of IP favors nursing care in the ICU environment, as well as patient safety and organization of the nursing team daily life, it was also possible to highlight difficulties based on the use of the aforementioned device, more specifically related to the drop sensors and triggering alarms. In this sense, modifications in IPs were suggested, which could improve the use of these devices in clinical practice.

The main complaint about the drop sensor cables was the configuration of the extension cable, which is coiled, similar to the design of telephone cables. This format is justified by the manufacturer to allow greater flexibility in the handling and easy coupling of the component to the drip chamber of the infusion system equipment.[17]

Although the easy handling of the coiled wire of the connection of IP is the intention of the manufacturer, it does not seem to meet the needs of the respondents. In addition, the format of the extender also prevents efficient disinfection, which can cause real problems, since microorganisms, including resistant ones, contaminate the device and are likely related to the way in which cleaning is conducted. [18] This problem could be minimized with the development of sensors with cables in other formats, or by operating via *wireless*.

Regarding the alarm system, this is triggered when the battery charge is near the end; dripping is absent and/or slower than programmed; air enters the equipment; or when the infusion of the medicine is almost completed, among others.[6,17] Regardless of the cause and the

visual specification in the equipment *display*, the volume and sound patterns are the same in all pumps.

Although the standardization of the IP alarm is perceived as a problem by the nursing team, it is necessary to remember that, in the ICU environment, there are other devices that have this type of system to assist the team in the early identification of clinical changes and adoption of behaviors for the restoration of organic functions.[1,2] In this scenario, the solutions infusion alarms could be more easily confused with the noise emissions of other devices, such as: mechanical ventilators and multi-parameter monitors.

In addition, the previous assumption that the possibility of setting up the alarm volume may also play as a risk factor during the use of the equipment because, according to the pertinent literature, this happens when the team adopts violation behaviors such as: disable the alarm or reduce the sound to inaudible levels.[3,8] Accordingly, it is suggested that actions of this type are counterproductive because they are against the goal of patient safety.[10]

The excessive noise caused by the incessant alarms of IPs, however, is a problem shared by other ICUs. The pertinent literature indicates that the excessive volume of alarms causes fatigue in the professionals of the health care team, with consequent desensitization of the worker to the sound, reduction of his/her state of readiness and, consequently, failure to meet the urgency induced by the alarm device.[19] In addition to the fatigue in workers, the excessive noise caused by IPs seems to have an impact on patients admitted to the ICU sector. A systematic review focusing on noise exposure in an intensive care unit found that, even sedated/unconscious, patients are able to recognize the sound produced by IPs. [20]

Concerning the suggestions given by the participants, although there was no impairment of the blood component when testing three models of intravenous infusion devices, the specific regulation that deals with blood therapy procedures mentions only the technical specifications of the equipment to be used in the transfusion act.[21] It is worth mentioning that,

in a literature review conducted in 2015, it was found the occurrence of hemolysis when administering blood components in infusion pumps.[22]

Regarding the change in the rate of KVO (open vein maintenance status) *in loco*, this procedure can already be performed by those who handle IPs and are described in the equipment manual under analysis.[17] Doubts or lack of knowledge of this information emphasize the need for continuous training of professionals and verification of the availability of manuals corresponding to the equipment in use, with easy access for reading and resolution of everyday issues.

The superficial knowledge of the volumetric IP of the brand adopted in the researched institution can be justified by the variety of pumps present in the ICU under study. In addition to this reason, the sector has specific IPs for enteral diet and syringe pumps, whose plurality of devices with practically the same purpose can influence on the lack of programmatic functions that the electromedical equipment in question may have.

Finally, regarding the suggestion pertinent to the advance programming of infusions to be started automatically, it is known that this resource is present in devices of other brands, different from that used in the ICU in focus. However, it is prudent to emphasize that, despite its importance, the delayed infusion should not impair the care to maintain the permeability of vascular accesses.[23]

Although the participants have indicated limitations in the IP equipment, with consequent suggestions for adequacy, there is a need for further technical and scientific knowledge to subsidize the proposed changes.

Final considerations

The double perception of the nursing team regarding the presence of IP in the everyday life of intensive care is remarkable – where they highlighted the positive and negative aspects about the use of such equipment during the care process. By pointing out the positive aspects, the assertive control of the volemic infusion that brings with it the rigor of the administration time, thereby providing accuracy and safety in the administration of medicines.

There were mentions about some negative points that this technological apparatus imposes on patient care in the ICU environment, such as: difficulty in handling it; immutability of the alarm, regarding its differentiation and volume; besides references to its *design*.

The reduced number of studies exploring this topic made it difficult to find references that corroborated or opposed the statements found in the interviews, but, at the same time, it brought greater relevance to the research when considering its applicability in the practical scope and to serve as a basis for future investigations. Accordingly, we should emphasize the importance of this work for the planning of strategies focused on the insertion and correct use of this technology in health care, in addition to the fact that it indicates possible adjustments to be made for better functionality of the equipment.

References

1. Tunlind A, Granström J, Engström A. Nursing care in a high-technological environment: experiences of critical care nurses. Intensive Crit Care Nurs. [internet] 2015 Abr [acesso em 2017 Out 12];31(2): 116-23. Disponível: https://www.ncbi.nlm.nih.gov/pubmed/25442241 doi: http://dx.doi.org/10.1016/j.iccn.2014.07.005

2. Ribeiro GSR, Silva RC, Ferreira MA. Technologies in intensive care: causes of adverse events and implications to nursing. Rev bras enferm. [internet] 2016 Set-Out [acesso em 2017 Set 09];69(5): 972-80. Disponível: http://www.scielo.br/pdf/reben/v69n5/en_0034-7167-reben-69-05-0972.pdf doi: http://dx.doi.org/10.1590/0034-7167.2016690505

3. Ribeiro GSR, Silva RC, Ferreira MA, Silva GR. Slips, lapses and mistakes in the use of equipment by nurses in an intensive care unit. Rev esc enferm USP. [internet] 2016 Mai-Jun [acesso em 2017 Out

3];50(3): 419-26. Disponível: http://www.scielo.br/pdf/reeusp/v50n3/0080-6234-reeusp-50-03-0419.pdf doi: http://dx.doi.org/10.1590/S0080-623420160000400007

4. Associação Brasileira de Normas Técnicas (ABNT). Norma NBR IEC 60601-2-24. Equipamento eletromédico – Parte 2-24: Prescrições particulares para segurança de bombas e controladores de infusão. Rio de Janeiro (RJ): ABNT; 1999.

5. Holsbach LR, Kliemann Neto FJ, Holsabach N. Utilização do instrumento de identificação de conhecimentos para administração segura de medicamentos com o uso de infusão automática. Rev Bras Eng Bioméd. [internet] 2013 [acesso em 2017 out 22];29(4): 353-362. Disponível: http://www.scielo.br/pdf/rbeb/v29n4/a05v29n4.pdf doi: http://dx.doi.org/10.4322/rbeb.2013.034

6. Dumas Junior A. Estudo metrológico volumétrico de bombas de infusão peristálticas lineares [dissertação]. 77f. Curitiba (PR): Universidade Tecnológica Federal do Paraná; 2016.

7. Souza V, Cortez EA, Carmo TG. Medidas educativas para minimizar os riscos ocupacionais na equipe de enfermagem da UTI. Rev pesqui cuid fundam. [Internet]. 2017 abr-jun [acesso em 2017 Ago 10];9(2): 583-91. Disponível em: http://www.seer.unirio.br/index.php/cuidadofundamental/article/view/4407. doi: http://dx.doi.org/10.9789/2175-5361.2017.v9i2.583-591.

8. Ribeiro GSR, Silva RC, Ferreira MA, Silva GR. Violações no uso de equipamentos por enfermeiros na terapia intensiva. Texto & contexto enferm. [internet] 2017 Jun [acesso em 2017 Out 3];26(2): 1-9. Disponível: http://www.scielo.br/pdf/tce/v26n2/pt_0104-0707-tce-26-02-e6050015.pdf doi: http://dx.doi.org/10.1590/0104-07072017006050015

9. Duarte SCM, Queiroz ABA, Büscher A, Stipp MAC. O erro humano no cotidiano da assistência de enfermagem em terapia intensiva. Rev latinoam enferm. [internet] 2015 Nov-Dez [acesso em 2017 Set 9];23(6): 1074-81. Disponível: http://www.scielo.br/pdf/rlae/v23n6/pt_0104-1169-rlae-23-06-01074.pdf doi: http://dx.doi.org/10.1590/0104-1169.0479.2651.

10. Organização Mundial da Saúde (OMS). Patient Safety: Making health care safer. Geneva (SZ): Organização Mundial de Saúde; 2017.

11. Agência Nacional de Vigilância Sanitária (BR). Resolução RDC nº. 7, de 24 de fevereiro de 2010. Brasília (DF): ANVISA; 2010.

12. Fontanella BJB, Ricas J, Turato ER. Amostragem por saturação em pesquisas qualitativas em saúde: contribuições teóricas. Cad Saúde Pública. [internet] 2008 [acesso em 10 ago 2017]; 24(1). Disponível: http://www.scielo.br/pdf/csp/v24n1/02.pdf doi: http://dx.doi.org/10.1590/S0102-311X2008000100003

13. Bardin L. Análise de conteúdo. Lisboa (PT): Edições 70 Ltda.; 2011.

14. Conselho Nacional de Saúde (BR). Resolução nº. 466, de 12 de dezembro de 2012. Brasília (DF): CNS; 2012.

15. Marsilio NR, Silva D, Bueno D. Drug incompatibilities in the adult intensive care unit of a university hospital. Rev bras ter intensiva. [internet] 2016 Abr-Jun [acesso em 2017 Out 11];28(2): 147–53. Disponível: http://www.scielo.br/pdf/rbti/v28n2/en_0103-507X-rbti-28-02-0147.pdf doi: http://dx.doi.org/10.5935/0103-507X.20160029

16. Silva R, Amante LN, Salum NC, Girondi JBR, Sebold LF. Incidentes e eventos adversos no transporte intra-hospitalar em terapia intensiva. Revista de Enfermagem do Centro-Oeste Mineiro [internet] 2018 [acesso em 2020 Mar 12];8:e2805. doi: http://dx.doi.org/10.19175/recom.v8i0.280

17. Laboratórios B. BRAUN S.A. Manual do usuário válido para software 4.00: Infusomat Compact. B-BRAUN. 2016 [acessado em 2017 out. 30]. Disponível: http://www.bbraun.com.br/service-layer-core/res/public/document/BPR0000000000000001000171113000000050569108E31ED690DFBE5E84D70308 0050569108E31ED690DFBE5E84D74308?vc=CW_PT_BR&s=0f8cb3c91f2c8f1011647a67fb9d86c8

18. Araujo MQ, Carvalhaes RP, Faria SM, Marinho MF, Santos FM, Santos TGQA. Perfil de resistência bacteriana em fômites de uti em hospital público do estado do Tocantins.Revista CEREUS. [internet] 2017 [acesso em 2020 Mar 12];9(2). Disponível: http://ojs.unirg.edu.br/index.php/1/article/view/1576/546

19. Amorim SC, Souza HV. Síndrome de Burnout em profissionais da enfermagem que atuam

na Unidade de Terapia Intensiva. Revista Pró-univerSUS. [internet] 2018 [acesso em 2020 Mar 15];09(2): 02-05

20. Sá R, Cruz I. Exposure to noise in intensive care: systematic literature review for a clinical protocol. Journal Of Specialized Nursing Care. [internet] 2016 [acesso em 2017 Out 12];8(1). Disponível: http://www.jsncare.uff.br/index.php/jsncare/article/view/2834/696

21. Ministério da Saúde (BR). Portaria Nº. 158, de 4 de fevereiro de 2016. Brasília (DF): Diário Oficial da União; 2016.

22. Pardo LP, Kusahara DK, Peterlini MAS, Avelar AFM, Pedreira MLG. Hemólise de eritrócitos em dispositivos de infusão intravenosa: revisão integrativa da literatura. Cogitare Enferm. [internet] 2015 [acesso em 2020 Mar 10]; 20(1):180-90. Disponível em: http://docs.bvsalud.org/biblioref/2016/07/623/37924-151107-1-pb.pdf

23. Agência Nacional de Vigilância Sanitária (BR). Medidas de Prevenção de Infecção Relacionada à Assistência à Saúde. Série Segurança do Paciente e Qualidade em Serviços de Saúde. Brasília (DF): ANVISA; 2017.

Corresponding author
Jessika Oliveira Calavaro
E-mail: jessika.cavalaro@hotmail.com
Address: Marcilio Dias Street, 737, Apt. 21, Zone 03 – Maringá, Paraná, Brazil
ZIP Code: 87050-120

Authorship contributions

1 – Jessika Oliveira Cavalaro
Conception and planning of the research project; obtainment of data; analysis and interpretation of data; writing.

2 – Nadia Raquel Suzini Camillo
Conception and planning of the research project; analysis and interpretation of data; writing.

3 – João Lucas Campos de Oliveira
Conception and planning of the research project; analysis and interpretation of data; writing.

4 – Kelly Cristina Inoue
Obtainment of data and critical review.

5 – Andressa Martins Dias Ferreira
Analysis and interpretation of data; writing.

6 – Laura Misue Matsuda
Conception and planning of the research project; analysis and interpretation of data, writting and critical review.

The way that you cite this paper

Cavalaro JO, Camillo NRS, Oliveira JLC, Inoue KC, Ferreira AMD, Matsuda LM. Use of the infusion pump in intensive care: perspectives of the nursing team. Rev. Enferm. UFSM. 2020 [Acesso em: Anos Mês Dia]; vol.10, e32 1-17. DOI:https://doi.org/10.5902/2179769233455