

PATIENT SAFETY IN THE ADMINISTRATION OF ANTIBIOTIC THERAPY AT THE ADULT ICU: RECOGNIZING THE RISK-GENERATING CONDITIONS

SEGURANÇA DO PACIENTE NA ADMINISTRAÇÃO DA ANTIBIOTICOTERAPIA EM UTI ADULTO: RECONHECENDO AS CONDIÇÕES GERADORAS DE RISCO

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ABSTRACT

Objective: To recognize the conditions that can generate risks for patient safety in an Adult Intensive Care Unit (A-ICU) during the antibiotic administration process. **Methodology:** Descriptive observational study conducted at an A-ICU, in the state of Rio Grande do Sul. Seventeen nursing technicians who assisted patients during the data collection period from April to October 2020, through direct observation of antibiotic administration, participated in the study. An adaptation of the Patient Safety Assessment in Medication Administration (ASPAM - *Avaliação da Segurança do Paciente na Administração de Medicamentos*) instrument was used for data collection, which evaluated the nine domains of safe medication administration. The data were analyzed through descriptive statistics, and the continuous variables were represented by mean and standard deviation or median and interquartile range (IQ), and the categorical variables by relative and absolute frequency. **Main results:** Low adherence to care was identified regarding the use of aseptic materials and techniques, and only six (35.3%) professionals performed these procedures every time they administered the antibiotic. Regarding the right documentation, only three (17.6%) professionals always recorded the time right after the administration. As for the orientation provided to the patient and/or caregiver about the administered medication, eleven (64.7%) professionals never gave any. **Conclusions:** the conditions that generated risk to patient safety during the administration of the antibiotic therapy were mainly related to the low adherence to the care regarding the right route, right documentation and right action. Therefore, the need for improvement of both assistance processes and team training were identified.

Keywords: Patient Safety; Nursing; Intensive Care Units; Medication Errors

RESUMO

Objetivo: Reconhecer as condições geradoras de risco para a segurança do paciente em uma Unidade de Terapia Intensiva Adulto (UTI – A) no processo de administração de antibióticos. **Metodologia:** estudo observacional descritivo realizado em uma UTI - A, no Rio Grande do Sul. Participaram do estudo dezessete técnicos em enfermagem que prestavam assistência aos pacientes no período de coleta de dados de abril a outubro de 2020, por meio de observação direta da administração de antibióticos. Utilizou-se uma adaptação do instrumento ASPAM - Avaliação da Segurança do Paciente na Administração de Medicamentos para coleta de dados, que avaliou os nove domínios da administração segura de medicação. Os dados foram analisados por meio de estatística descritiva, sendo que as variáveis contínuas foram representadas por média e desvio padrão ou mediana e intervalo interquartil (IIQ) e as categóricas por frequência relativa e absoluta. **Principais resultados:** Identificou-se baixa adesão aos cuidados na utilização de materiais e técnicas assépticas, sendo que somente seis (35,3%) profissionais realizaram este cuidado todas as vezes na preparação dos antibióticos. Em relação ao registro certo, apenas três (17,6%) profissionais sempre registraram o horário logo após a administração. Quanto a orientação realizada ao paciente e/ou acompanhante sobre o medicamento administrado, onze (64,7%) profissionais nunca orientaram. **Conclusões:** as condições geradoras de risco a segurança do paciente na administração da antibioticoterapia estavam principalmente voltadas a baixa adesão dos cuidados quanto a via certa, registro certo e orientação correta. Identificaram-se assim necessidades de melhoria tanto de processos assistenciais quanto de capacitação de equipe.

Palavras-chave: Segurança do Paciente; Enfermagem; Unidades de Terapia Intensiva; Erros de Medicação.

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INTRODUCTION

The topic of patient safety has sparked new discussions every year, since patients worldwide are subject to errors related to care, which can occur at different moments of care. Among the main errors that occur in the hospital environment and that have been assessed in several studies, are those related to medication administration⁽¹⁻²⁾.

A medication administration error is defined as a preventable error that can be hazardous to the patient or when it is inappropriately utilized under the care of health professionals⁽³⁻⁴⁾. The Institute for Safe Practices in Medication Use (ISMP, *Instituto para Práticas Seguras no Uso de Medicamentos*) has identified that 8,000 deaths are caused by medication administration errors, with 7.0% of hospitalizations in the health system resulting from failures or adverse reactions due to medication administrations, which represents 840,000 cases / year⁽⁵⁾.

Among the medications that most often cause adverse events are the antibiotics, frequently used in the treatment of infections, so that their administration at different times than those prescribed and when incorrectly diluted, generate greater adverse events for patients, in addition to the costs to the health system⁽⁶⁻⁷⁾. The adverse events related to antibiotics are due to their direct toxic effects, development of antimicrobial resistance and

allergic reactions induced by the medication⁽⁷⁻⁸⁾.

Nursing professionals are prone to errors related to medication administration, as they manipulate these medications and provide direct patient care. There are barriers related to medication administration that, when performed correctly, can prevent the error from affecting the patient at this step of the process, the “nine correct stages of medication administration”, which are: right patient, right drug, right route, right time, right dose, right documentation, right action, right form and right response^(2,9-10). The act of administering the medication to the patient is the last step to stop the error and, therefore, the professional must be trained and attentive to all administration stages so that the error does not affect the patient (1-2).

It is important that hospital units recognize their processes and the flaws that permeate their actions, aiming to identify risk-generating conditions for patient safety during the administration of medications. Thus, we expect to contribute to the qualification of work processes and the effectiveness of antibiotic therapy, avoiding future adverse events or promoting their minimization⁽¹¹⁻¹²⁾.

Studies that aim to improve the patient safety process are important for health professionals, as they improve their care and guarantee the quality of the provided service, being a current and pioneering subject that

helps workers to know its effects and causes on patients ^(2,3). In this context, the topic of this study, which is related to antibiotic administration safety, is important because it is one of the goals of Patient Safety improvement introduced by the World Health Organization (WHO)⁽¹³⁾.

Considering the above, this study aimed to recognize the risk-generating conditions for patient safety in an Adult Intensive Care Unit (A-ICU) regarding the antibiotic administration process based on the instrument Patient Safety Evaluation in Medication Administration (ASPAM, *Avaliação da Segurança do Paciente na Administração de Medicamentos*) validated in a previous study ⁽¹¹⁾.

METHOD

This is a descriptive observational study with a quantitative approach, carried out in an A-ICU located in the state of Rio Grande do Sul, Brazil, requiring a situational diagnosis to propose improvements in care processes, with accreditation being one of the institution's goals. The hospital is a philanthropic institution, characterized as a teaching hospital with 232 beds, of which 10 are adult intensive care beds, with eight of them intended for general patients and two for high cardiovascular complexity patients, since the institution is a regional reference in this area.

This study had a convenience sample and included the technical nursing team, hired by the hospital unit, who was working in the unit at the beginning of data collection period and signed the informed consent form (ICF). Those working in the unit for less than three months were excluded.

The research met all ethical precepts established by the National Health Council Resolution n. 466/12 and was approved by the Research Ethics Committee of Universidade de Santa Cruz do Sul (CEP/UNISC), under Opinion n. 3.920.109. All participants were informed about the research objectives, as well as the risks and benefits of their participation, and signed the informed consent form.

Data collection took place from April to October 2020 through direct observation of the nursing care provided by the nursing technicians when administering antibiotic therapy to patients during the institution's four existing work shifts, which are six-hour shifts (1am-7am, 7am-1pm, 1pm-7pm, 7pm-1am).

To document the observations, a scale already validated in Brazil called ASPAM - Patient Safety Evaluation in Medication Administration - was adapted and used, which showed a Cronbach's alpha of 0.85 for its 28 items, indicating high internal consistency of the instrument ⁽¹¹⁾. The scale evaluates the nine domains of safe medication administration, being: right patient (item 1), right medication (items 2 to 6), right route (items 7 to 10), right

time (items 11 to 13), right dose (items 14 to 18), right documentation (items 19 to 23), right action (items 24 and 25), right form (item 26) and right response (items 27 and 28), thus totaling 28 items along the scale.

The items that comprise the instrument have a fixed response format, of a Likert Scale type (1 - never, 2 - almost never, 3 - sometimes, 4 - almost always and 5 - always), in which the evaluating professional chooses only one option after observing the medication administration process. The identification of risk-generating conditions for patient safety when administering antibiotic therapy was carried out through the sum of the scores obtained while using this instrument.

Of these 28 items, some were excluded from the observations in the present research because they did not fit the routine of the unit where the study was carried out; thus, items 4, 5, 6, 13, 16, 18, 20, 21, 22, 23, 24, 27 and 28 were removed and the “right answer” domain was not evaluated, because it is not possible to assess whether the medication had the desired effect at the end of the antibiotic therapy administration process, as the effect does not appear in the short term.

An instrument was also used to assess the participants' sociodemographic characteristics, using a questionnaire that included information on gender, age, training, time of training, time of professional

experience, number of employment relationships and previous experiences.

To recognize the conditions that can generate risk to patient safety, the data collected were tabulated using Excel 2013 software and after that, they were processed using the statistical program Statistical Package for Social Sciences (SPSS), version 23.0 and analyzed using descriptive statistics, with continuous variables being presented as mean and standard deviation (data with normal distribution) or median and interquartile range (IQR) (data without normal distribution), whereas categorical variables were presented as relative and absolute frequency.

RESULTS

Seventeen nursing technicians participated in the study, with the observation of 41 antibiotic preparation and administration procedures, an average of two per professional, in the four work shifts. Of these professionals, 13 were females and four were males. The mean age of the group was 32.1 years (with a standard deviation of 8.1). The group consisted predominantly of nursing technicians, with only one professional being specialized in ICU. As for the time of training, the median was 5 years (IQR: 4-10 years). Thirteen technicians had previous experience in other hospital units. Regarding the time of professional experience, the median was 5 years (IQR: 4-9 years). As for the employment relationship, six declared

that they worked in more than one location and the other eleven worked exclusively at the unit where the study was carried out.

To present the risk-generating conditions for patient safety regarding the administration of antibiotic therapy, the occurrence of the eight 'right' steps in medication administration was observed, and the ninth right (right response) was removed from the evaluation as previously described. Chart 1 shows the measured indicators for patient safety assessment when administering antibiotic therapy. It was observed that the only assessed indicators that met the criteria for patient safety in 100% of the observations were "Brings to the bed only what is prescribed to a single patient" and "Checks the drip speed, the

programming and operation of the continuous infusion pumps with the prescription". The indicators that showed a prevalence of adherence by nursing technicians below 50% were: "Washes their hands before preparing and administering medications.", "Uses aseptic materials and techniques to administer the medications. "Records the time of medication administration in the prescription immediately after each dose" and "Guides the patient and the caregiver about the administered medication (name), aspect (color and shape), justification of the indication, frequency at which it will be administered, and expected effects". The other assessed indicators showed a prevalence of around 75%.

Chart 1. Description of the indicators of evaluation of Patient Safety in the administration of antibiotics by nursing technicians in the Adult Intensive Care Unit. Santa Cruz do Sul, RS, Brazil, 2020.

ASSESSED INDICATORS	N (%)				
	Never	Almost never	Sometimes	Almost always	Always
Right Patient Uses at least two identifiers (full name and medical record number) to confirm it is the right patient before administering medications.	3 (17.6)	-	1 (5.9)	-	13 (76.5)

Right medication					
Verifies the name of the medication in the prescription before administering it to the patient.	3 (17.6)	-	1 (5.9)	-	13 (76.5)
Brings to the bed only what is prescribed to a single patient.	-	-	-	-	17 (100.0)
Right route	3 (17.6)	-		-	13 (76.5)
Identifies the prescribed route of administration for the medication.			1 (5.9)		
	3 (17.6)	-		-	13 (76.5)
Verifies whether the prescribed route is technically recommended for administering the medication.			1 (5.9)		7 (41.2)
Washes their hands before preparing and administering medications.	4(23.5)	2(11.8)	4(23.5)	-	7(41.2)
Uses aseptic materials and techniques to administer the medications.	7(41.2)	-	3(17.6)	1(5.9)	6(35.3)
Right time	-	-	1(5.9)	-	16(94.1)
Prepares the medication immediately before the administration.)		
Administrates the medication at the right time.	1(5.9)	-	1(5.9)	1(5.9)	14(82.4)
)		
Right dose			1 (5.9)	-	13 (76.5)
Carefully check the prescribed medication dose.	3 (17.6)	-		-	
Checks the drip speed, the programming and operation of the continuous infusion pumps with the prescription.	-	-	-	-	10*(100)

Uses standard measuring tools to prepare medications to accurately measure the doses (e.g., millimeter syringes).	-	-	1(5.9)	-	15(82.2)
Right documentation Records the time of medication administration in the prescription immediately after each dose.	7(41.2)	2(11.8)	4(23.5)	1(5.9)	3(17.6)
Right action Guides the patient and the caregiver about the administered medication (name), aspect (color and shape), justification of the indication, frequency at which it will be administered, and expected effects,	11(64.7)	-	5(29.4)	1(5.9)	-
Right form Checks whether the medication to be administered has the pharmaceutical form (e.g., ampoule, bottle, tablet) compatible with the prescribed route of administration.	3 (17.6)	-	1 (5.9)	-	13 (76.5)

Source: study data.

* This indicator had fewer observations due to the fact that some antibiotics did not require drip control.

DISCUSSION

During the observation of the practice when administering antibiotic therapy, it was verified that female professionals predominated. This predominance can be considered in relation to the cultural process that shows that nursing professionals are historically mostly women. As for the time of training, it was longer in the present study, 8.5 years, when compared to professionals in an Adult ICU of a hospital in the state of Sergipe, which showed had an

average of 5.5 years of professional training⁽¹⁴⁾. The increase in the time of professional experience becomes a positive point, since previous professional experience contribute to the strengthening of knowledge, skills and attitudes, which may result in greater safety in the provided care⁽¹⁵⁾.

Regarding the employment relationship, most professionals were working exclusively at the institution where the study was carried out, which can be a positive factor, as the

professional may experience less physical and mental stress during the work shift, which is different from when it is necessary to work more than one job ⁽¹⁶⁾.

Studies have shown that work overload are factors that can contribute to errors in the care process. A study carried out in an ICU of a public hospital in the interior of the state of Bahia sought to analyze the perception of patient safety for nurses with double working hours and their influence on care, which demonstrated that the interviewees believe that the accumulation of hours worked uninterruptedly compromise patient safety, in addition to leading to work overload, resulting in physical and mental exhaustion ⁽¹⁷⁾.

The indicators presented herein are directly related to patient safety when administering antibiotics, so that it was possible to identify factors in the work process that can both promote it and have a negative impact on care. Regarding the indicators with positive results, one of them, "Brings to the bed only what is prescribed to a single patient" can be facilitated by how the work process is established in the unit, since the dispensing of medication is carried out by the pharmacy assistant, who takes the patients' medication to their bed, facilitating the dispensing process and reducing factors that can result in error. Each ICU bed has a counter for medication storage and preparation, and the assistant obtains the prescription of the day at the

pharmacy, containing all the medications that will be used for each patient in a 24-hour period, storing at the bed only the medications prescribed to a single patient.

As for drip control and the programming and operation of continuous infusion pumps, this item showed adherence by all professionals in the present study, which corroborates the study carried out at a Hospital in the state of Sergipe in an Adult ICU, which sought to evaluate the compliance of care and adherence of nursing professionals in medication administration, showing an adherence rate of 99.2% of the observations related to this item ⁽¹⁴⁾.

The facilitator of this process may be related to how the medical prescriptions observed in this study are issued, which includes the type of drip used for the said medication and the need for its infusion using a volumetric pump. Adherence to this item depends on the professional's attention in complying with the prescription, which demonstrates the team's technical training in relation to care. Adherence to this indicator directly reflects the desired effect of antibiotic use, as the time of infusion can have an adverse effect on the medication ⁽⁷⁻⁸⁾.

Factors that can adversely affect patient care were identified mainly among those related to infection control. Attention is drawn to the pertinent care regarding hand hygiene in the preparation and administration of antibiotics,

since only seven professionals performed it every time before administering the medication. A study carried out in a university hospital in the state of São Paulo observed that at the medication preparation stage, 70.2% of the professionals did not perform hand hygiene, and in another study carried out in a philanthropic hospital in the state of Minas Gerais, it was observed that in 50% of the occurrences, lack of hand hygiene was verified during the observations when preparing medications, which is in agreement with the results found in this study ^(18,19).

The same occurred with the use of aseptic materials and techniques, in which only six professionals performed this step every time during the preparation of antibiotics, demonstrating commitment with patient safety regarding the risk related to bloodstream infections. The professionals did not stop to perform the disinfection of the ampoules and venous access devices before the administration of antibiotics, which compromises care. A descriptive study carried out in a teaching hospital in an ICU in the city of Brasília aimed to observe errors in the administration of antibiotics and found a lack of disinfection of medication vials in 58.4% of the observations. The same occurred in a study at the university hospital in São Paulo, which assessed the types and frequencies of errors in the preparation and administration of intravenous medications and observed that the

aseptic technique was not performed in 80.8% in the preparation step and 84.8% in the medication administration step ^(18,20).

Healthcare-associated infections (HAIs) are those acquired during the hospitalization process or another unit providing assistance and are recognized as an adverse event that puts patient safety at risk. Among the infections with the highest incidence are surgical site (SSI), urinary tract (UTI), and bloodstream (BSI) infections and mechanical ventilation-associated pneumonia (VAP) ⁽²¹⁾.

In the context of the ICU, it can be stated that it is the hospital section with the greatest susceptibility to acquiring HAIs, as ICU patients show greater hemodynamic instability and require the use of invasive devices for longer periods of time ⁽²¹⁾. Thus, the low adherence of professionals regarding the use of aseptic materials and techniques and hand hygiene can negatively influence patient safety.

A study carried out in a university hospital in Brazil, observed the opportunities for hand hygiene in four different wards, namely, clinical, surgical, pediatric and ICU units, with an average adherence of 21.0% as a result. The low adherence to hand hygiene is discussed in relation to work overload, difficulty in accessing the physical structure, lack of stimulus and lack of material to perform it, such as difficulty finding sinks and empty

gel alcohol dispensers. Some suggestions for improving these processes comprise the observation and feedback of actions to professionals, as well as the adequacy of the physical space and materials ⁽²²⁾. Regarding the documentation in the prescription of the time of medication administration, immediately after it is done, there was low adherence by the team, as only three professionals always recorded the administration time. It was observed that in the first shift (1pm-7am), the registration was carried out before the medication was administered, which is a matter of concern, as the incomplete checking raises doubts about its performance, and the uncertainty regarding the checking can lead to the patient receiving medication in duplicate or even not receiving it. The checking of the medication before it is administered leads to the belief that it was performed before the time prescribed in the medical prescription, involving losses in the patient's evolution, such as adverse events ⁽²³⁾. A study carried out in the state of Sergipe identified a general adherence rate to the right documentation of 33.3%, which demonstrates a poor provided assistance ⁽¹⁴⁾.

As for the orientation given to the patient and caregiver regarding the name of the administered medication, this was the item with the worst result, since eleven of the professionals never gave advice about the administered medication. This denotes a failure

in the patient safety process, which was also demonstrated in the study carried out in Sergipe, where non-significant adherence rates, ranging from 0.88% to 2.63% for every hundred observed opportunities were identified. We consider that the failure of professionals to perform this item may be related to the fact that several patients are sedated or in a coma, but that despite the patient's sensory level, patient safety protocols mention the importance of correct orientation and that it should be performed regardless of the patient's level of consciousness. Low adherence compromises the quality and safe practice of medication administration ⁽¹⁴⁾.

To recognize these indicators was an opportunity to make a situational diagnosis that identifies the need for both the improvement of care processes and staff training, considering that indicators such as hand hygiene and use of aseptic materials and techniques can be improved through educational interventions. Failure to comply with infection control and prevention care requires intervention at the level of training and awareness of the teams, since in the unit where the study was carried out, the structure and work process allow, for instance, the performance of all the care processes recommended by ANVISA. The entire ICU structure has sinks with liquid soap dispensers, alcohol gel dispensers and paper towels by their beds, demonstrating that the main problem regarding the failure in

performing hand hygiene is not in the structure, but the professionals' negligence, who do not perform these procedures^(16, 21).

As a study limitation, a low prescription of antibiotics was observed, which resulted in an insufficient number of scheduled antibiotic administrations in the period that comprised the second work shift of the study location (7am – 1pm), thus making data collection difficult. Another point to be highlighted were the items that could not be evaluated using the ASPAM instrument, because they refer to situations that did not occur during the administration of antibiotic therapy. Future studies are suggested, which will be applied in other scenarios, such as urgency/emergency and inpatient units, to

include to a wider scope of classes of medications and not only antibiotic therapy.

CONCLUSIONS

This study allowed us to recognize that the conditions that generate risk to patient safety when administering antibiotic therapy were mainly those related to low adherence to infection control measures, right documentation and right action. By listing these risk-generating conditions, it was possible to reflect on the need to continue investing in the qualification of work processes and propose changes that will improve scenarios that interfere with the quality of patient safety related to the administering of medications.

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