

Human error in daily intensive nursing care¹

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Objectives: to identify the errors in daily intensive nursing care and analyze them according to the theory of human error. **Method:** quantitative, descriptive and exploratory study, undertaken at the Intensive Care Center of a hospital in the Brazilian Sentinel Hospital Network. The participants were 36 professionals from the nursing team. The data were collected through semistructured interviews, observation and lexical analysis in the software ALCESTE[®]. **Results:** human error in nursing care can be related to the approach of the system, through active faults and latent conditions. The active faults are represented by the errors in medication administration and not raising the bedside rails. The latent conditions can be related to the communication difficulties in the multiprofessional team, lack of standards and institutional routines and absence of material resources. **Conclusion:** the errors identified interfere in nursing care and the clients' recovery and can cause damage. Nevertheless, they are treated as common events inherent in daily practice. The need to acknowledge these events is emphasized, stimulating the safety culture at the institution.

Descriptors: Patient Safety; Medical Errors; Nursing Care; Intensive Care Units.

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Introduction

The Intensive Care Center (ICC) is a specialized treatment center, where the role of expert nurses evolved to attend to the health needs and the context of change in nursing care. The International Council of Nurses (ICN) defined this professional beyond the generalist level, authorized to exercise specialized activities, with advanced experience in a nursing branch⁽¹⁾.

Due to the complexity of the clients attended in the ICC, intensive care should be delivered rapidly, involving different procedures and producing a large information volume. Therefore, a large number of professionals is needed, beyond constant professional qualification, investment in good communication, attention to teamwork, safety climate and satisfaction of the activities performed⁽²⁻³⁾.

What patient safety is concerned, in recent years, efforts to avoid errors have increased in developed and developing countries. Nevertheless, further resources are needed for education, research and the implementation of error prevention practices. To improve the quality of care, the health professionals need to treat this theme as a priority, as promoting the safety culture is a key element to stimulate the communication of errors in health organizations⁽³⁾.

Patient safety can also be related to the length of hospitalization as it is often difficult in critical care patients to assess the level of damage attributed to the occurrence of the error and adverse events⁽⁴⁾.

Thus, the nursing team active at the ICC should be prepared for the daily difficulties, related to the complexity of care and the charges of patients and family members, the multiprofessional team and the institution. Error events can cause feelings of frustration and shame, making appropriate reporting more difficult.

Human error interferes directly in patient safety, defined by the World Health Organization (WHO) as the reduction of the risk of unnecessary harm related to health care to an acceptable minimum⁽⁵⁾.

Error or incident can also be understood as an event or circumstance that could have resulted or resulted in unnecessary harm to the patient, whether originating in intentional acts or not. When it does not affect the patient or is detected in advance, it can be called a near miss. When it does affect the patient but without causing discernible damage, it is called an incident without damage. And when it results in discernible damage, it is called incident with damage or adverse event⁽⁵⁾.

The adverse event is the simplest form of quantitative error recognition, as it causes direct damage, being more easily identified. The scientific literature contains few reports of error that did not cause damage to the clients and the team may not recognize them in daily care.

The objectives in this study are to identify the errors in daily intensive nursing care and to analyze them according to James Reason's theory of human error⁽⁶⁾.

Methods

Qualitative, descriptive and exploratory study undertaken at the Intensive Care Center (ICC) of a general federal hospital that is a member of the Brazilian Network of Sentinel Hospital of the Brazilian Health Surveillance Agency (ANVISA).

The nursing team at the ICC consists of 83 professionals, 36 of whom participated in this study, including 13 nurses and 23 auxiliary nurses. The participants were selected according to the inclusion criteria: working at the ICC where the study was undertaken and having worked at the sector for more than six months. The exclusion criterion was: being on leave from the ICC during the data collection period due to holidays and different leaves.

The participants' profile was characterized based on sex, professional category, age, length of education and length of experience at the ICC. Anonymity was maintained through a codename, using the abbreviations Sub., followed by the number indicating the order in which the interviews were held, with Sub. 1, Sub. 2, Sub. 3 and so forth.

The data were collected between July and September 2013 through individual interviews and participant observation. The tools were elaborated by the authors and the semistructured interview script consisted of the following questions: how do you understand human error in nursing care? What error situations do you identify in daily nursing care? The interviews were recorded in MP4 and transcribed by the interviewer.

The participant observation script guided the activity through the following topics: is the scenario favorable to patient safety and to the prevention of human error? How do the participants interrelate? Identify possible error situations? The time used was 130 hours and the observations were reported in a field diary, registering daily situations, reports and the participants' answers to the interviewer's inquiries, impressions and narratives.

To collect the data, the participants received information on the study and objectives, guaranteeing that the content collected would only be used after authorization and significant of the Free and Informed Consent Form.

The interviews were subject to lexical data analysis, using the software *Analyse Lexicale par Context d'um Ensemble de Segments de Texte* - ALCESTE®. The observation data were submitted to ethnographic analysis and the results were presented complementarily to the results produced in ALCESTE®. The obtained results were submitted to the authors' critical analysis, in accordance with the scientific literature and James Reason's theory of human error.

The software ALCESTE® was developed by Max Reinert in France in the 1970's and is based on calculations made about the co-occurrence of words in text passages. The goal of ALCESTE® is not to simply calculate words separately, but to organize a discourse by evidencing the lexical worlds⁽⁷⁾.

In the software, the vocabulary of a statement constitutes a reference and has a function, an intended meaning of the enouncing subject and different points of reference produce different ways of talking. The analysis through ALCESTE® distinguishes classes of words that represent different forms of discourse on the study object, using Descending Hierarchical Classification (DHC) and offering lexical classes that are characterized by their vocabulary and by the text segments that share this vocabulary⁽⁸⁾.

For this analysis, a corpus was prepared, aiming to correct orthographic errors and language vices. Each interview is equivalent to an Initial Context Unit (ICU) and, thus, the program analyzed 36 ICUs, preceded by their respective command lines, constituted by the variables that corresponded to the characterization of the study participants. After the recognition of the ICU program, the material was divided in Elementary Context Units (ECU), which are text segments of three to six lines that contain the smallest fragment of meaning.

The corpus produced three lexical classes, named according to the analysis of the meanings and senses of the corresponding words and the most significant ECUs in each class. For the sake of this study, however, the contents in class 3 will be explored and discussed, where the lexicons related to the study objectives are concentrated. According to the lexical meanings, it was called "Human error in intensive nursing care".

As to the ethical and legal aspects, the study was submitted to the Research Ethics Committees

(CEP) through the Platform Brazil and approved under protocols 229.926 and 000.493, complying with all aspects of National Health Council Resolution 466/12 for research involving human beings.

Results

The study participants were 36 nursing team members, including 13 nurses (36%) and 23 auxiliary nurses (64%). As regards the sex, 81% belonged to the female sex and 19% to the male. The age range varied between 30 and 59 years, where 61% were between 30 and 39 years, 31% between 40 and 49 years and 8% between 50 and 59 years.

What the time since professional graduation is concerned, 40% of the interviewees had graduated less than ten years earlier, 37% between 11 and 20 years, 18% between 21 and 30 years and 5% more than 31 years earlier. Concerning the length of work at the ICC, 19% had less than three years of experience, 73% between four and 10 years, and 8% between 21 and 30 years.

The corpus analyzed in ALCESTE® obtained 74% of use, with 4,466 distinct analyzable forms or words, 1,181 selected UCE, 73% of which were classified in three classes, divided in two thematic blocks. The first thematic block only produced class 3, the focus of this study, and represented 34% of the total corpus, consisting of 161 analyzable words and 292 UCE.

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Errors were identified in the daily reality of intensive nursing care. Through the lexical analysis, the establishment of thematic groups for discussion was observed, including the link of words, such as: contamination - X rays - laboratory, change - bed - name, and mix - pump - noradrenalin.

The participants mentioned the medication errors, illustrated through the words medication (Khi2 101), patient (Khi2 75), put (Khi2 45) and change (Khi2 42), remitting to the problems in medication preparation and administration.

And, even more now (...), you can't stay quiet, otherwise everything can turn into a mess. You need to move forward, move to the head. To give an example, today I got the prescriptions and yesterday, there were three nurses here, and there was no daily verification in any of the prescriptions (UCE 519).

I happened that the patient had a fever and I applied dipyrone. Then I didn't inform the team and it has not been verified, and it may be done again. Sometimes, the doctor

asks something (...) and it wasn't even an emergency, it was a tube change and it's among us really. He asks for dipyrone and we don't write it in the balance sheet and in the prescription (UCE 158).

The nursing team also associated the inappropriate handling of the infusion pumps with the medication administration error. *Sometimes you can't handle the pump correctly, or lack of attention. It has happened, like midazolam that has to drip until morning and, when you look 02 hours later and everything's finished already, and then the patient is hypotensive and all decompensated (UCE 283).*

In daily care, the pump alarm was often ignored, due to the multiple tasks the professionals performed. Sometimes, all professionals were busy with patient care and, when an alarm rang, it was not readily attended to, but sometimes remained active for 10 to 15 minutes. This fact was identified during the observation, where the alarm of an infusion pump ran for 15 minutes, without anyone verifying what was happening. Thus, I silenced the alarm and found out that the saline solution with electrolytes that was being infused had terminated. I informed the team, and a new solution was installed (excerpt from the field diary).

They simply do not warn, the noradrenalin pump whistling because the solution is finished and you're at the bedside with another patient and there's a resident or any other person passing by and goes there and stops or turns off the alarm and doesn't tell anyone (UCE 834).

The participants also mentioned the lack of communication in the nursing team, mainly between the medical team and the nursing team. *In the medication, one error I witness more frequently is the medication change, generally between the prescription and what's in the pump, the medication that is dripping but has not been prescribed and the medication that has been prescribed but is not dripping (UCE 805).*

Not raising the bed rails was mentioned and related to the risk of falling from the bed, with damage to the attended clients. This problem was identified through the words bed (Khi2 41) and rail (Khi2 26).

Something else I have already witnessed was neglect and the patient falling from the bed (UCE 768).

To give an example, the rail. Sometimes there's a disoriented patient and, sometimes, not so much nursing, but the bed rail is down (UCE 745).

When I accompanied the bed bath by a nursing technician, I identified that he left the bedside four times to pick up material, leaving the patient who was linked to a ventilation prosthesis through an orotracheal tube (OTT) and sedated, with the bed head at zero degrees, exposed

and with all rails down. I asked questions about what had happened and he justified himself by affirming that the patient was sedated with propofol and that he was sure that nothing would happen (excerpt from field diary).

The containment and surveillance of agitated patients are related to this theme, as some ICC bed cannot be visualized directly from the nursing station.

There was one situation that has happened to me and I don't even know if I can consider it a human error, but simply when I saw it, the patient was in the corridor. One patient with MBP catheter, deep access and he disconnected everything, jumped the rail and went onto the corridor. (...) It was that rush, there were few workers and that happened. MBP blood all over, he lost the deep access. There was another badly contained patient who removed his tube, and two years ago that happened (UCE 769-770).

Not raising the rails was also related to the quality of the furniture used at the ICC, given the difficulty to block the bed rails. *The rail that lowers is close and, if you don't put it right, it will drop. So you can't block it right and it drops. There are other problems also related to the bed, the wires, but it is fixed to the mattress and, when you lower it, if you don't observe everything around it, you pull out a probe so, not only is the bed bad, the rail is not good either (UCE 132-133).*

The occurrence of unprogrammed extubations was related to x-rays in the bed, through the word x-rays (Khi2 36). *And you go and look and the patient's got that right, he's on ventilation, but it's out of place, because sometimes, the x-ray has gone by, it was retracted and you looked from far off and thought everything was fine, but when you go and look, he's extubated (UCE 804).*

The inappropriate material resources and the lack of maintenance were also mentioned, highlighting the occurrence of problems with the transportation monitor while taking a hemodynamically unstable patient for a test outside the ICC. *What happened then, I immediately took the monitor and said to take it out of here, they really made it disappear. I said call the responsible technicians and said that I had asked for him to check it and he didn't, so I said I didn't want it here anymore and, if there were a test, I wasn't gonna come down because of it. (...) Because it's been months we ask to see this monitor and something like that had to happen to have a more drastic solution, to take the monitor and fix it, and he brought another the same day (UCE 516-517).*

The professionals' inappropriate use of cloaks and gloves and inappropriate hand washing were also mentioned, and can contribute to the dissemination of cross-infection, being associated with the words cloak (Khi2 37), x-rays (Khi2 36) and gown (Khi2 26).

We've always had the routine that everyone uses a cloak. It's just that nursing uses a cloak, the medical team doesn't, x-ray doesn't, laboratory doesn't. But only nursing receives charges in that sense. Something else I've noticed is that the medical team does not know how to put on or take off the cloak, they don't use gloves, they turn the sleeve (UCE 935).

Through observation, the use of cloaks was identified for all patients, independently of the need or not for contact precaution. The type of precaution was signaled through a sign above the bed. I asked the team and was informed that this was a former routine and that, nowadays, the institution's Hospital Infection Control Commission (HICC) recommends the use of cloaks only for patients in contact precaution but, as the nursing team is notified late by the medical team about the need or not for precaution, they choose to use cloaks on all patient (excerpt from field diary).

It was observed that some professionals cleaned and washed their hands appropriately for nursing care, while others did not, besides walking around the sector with used gloves. (...) During the bed bath, one nursing technician who was wearing a cloak and gloves left the bedside to register the fluid balance without removing her clothing, walking around the ICC and touching other equipment (excerpt from field diary).

The participants highlighted difficulties to change the established culture and the need to reorganize the ICC standards and routines. *You need to signal it. Today was one day, when I got the shift and I had to (...) say it. What's going on with these patients? It seems like a hurricane went by here (UCE 523).*

The nursing team complained about the lack of training and professional qualification, establishment of standards and routines, and better definition of each professional category's functions. The professionals also indicated the team's lack of commitment, often making them act "automatically", negatively affecting the care (excerpt from field diary).

Discussion

Human error interferes in nursing care and clients' recovery at the ICC. Errors can often be detailed and classified as inherent in daily hospital reality, resulting in patient damage or not.

In the theory of human error, also known as the "Swiss Cheese Model", the errors can be studied in two senses: personal approach and systems approach. The first is related to people's practice of unsafe acts. On the opposite, the systems approach considers that human

beings make mistakes and that errors are expected, even in the best organizations, considering them as more of a consequence than a cause, originating in systemic factors⁽⁶⁾.

The central idea of defense systems like the "Swiss Cheese Model" is based on the personal approach and considers that, when an adverse event takes place, what matters is not who committed the error, but how and why the defenses failed. Ideally, each defense mechanism should be intact, but these mechanisms contain individually harmless flaws. When aligned, however, they lead to the probability of a dangerous event⁽⁹⁾.

The defense loopholes are due to two reasons: active faults and latent conditions. The active faults are represented by the unsafe acts, committed by people who are in direct contact with the system, which can take the form of slips, oversight, losses, errors and violations. In this study, the active faults are represented by the administration and medication verification errors, not raising the bed rails, inappropriate patient surveillance, inappropriate use of cloaks and gloves and inappropriate hand washing.

In a cross-sectional and retrospective cohort undertaken at a surgical clinic of a hospital from the Sentinel Network, the presented data were confirmed, identifying the omission of a medication dose (in 34.6% out of 2,610 hospitalizations monitored) and absence of medication verification (29.3%)⁽¹⁰⁾ as the most frequent incidents.

What the risk and severity of the medication errors are concerned, an exploratory study developed at a medical clinic of another hospital in the Sentinel Network identified 52 faults that can occur during the medication administration process. The main potential faults were identified in the medication administration (30.8%), followed by the medication preparation (23.1%). The study highlights that 66.2% of the events were considered of medium severity, demanding monitoring, assessment and specialized treatment to revert the damage, which interfered in the baseline treatment, including extension of the hospitalization time, and 27.5% were highly severe events that needed interventions to preserve the patient's life⁽¹¹⁾.

In the interviews, not raising the bed rails and the lack of patient surveillance were related with the risk of falls and unprogrammed extubations. The damage these events can cause to the patients' physical and emotional integrity should be taken into account, besides the stress caused to the professionals and the financial

consequences for the institution. Preventing falls is considered one of the foci of patient safety, listed and recently revised by the *National Quality Forum* (NQF), a North American non-for-profit organization that aims to improve the quality in the health area⁽¹²⁾.

Falls are common at the hospitals, appointed as responsible for two out of every five adverse events. The lesions deriving from the falls happen in between 15 and 50% of the events, resulting in a wide range of damage, such as post-fall syndrome, increased morbidity, recovery problems and increased hospitalization⁽¹³⁾.

The harm the falls cause is also related to the length of hospital stay and the increased costs of care. International studies report on a wide range of amounts for the incidence of hospital falls, ranging from 2 to 15% of hospitalized patients who were victims of at least one fall⁽¹⁴⁾.

The unprogrammed extubations can be related to physical containment, sedation level, patient activity and mental status, which are considered frequent events in critically ill patients and are associated with increased hospital morbidity and mortality. The extubations can also cause hypoxemia, atelectasis, pneumonia associated with mechanical ventilation, tracheal lesion, hemodynamic instability and cardiac arrest⁽¹⁵⁻¹⁶⁾.

The latent conditions refer to the pathologies intrinsic in the system, emerge from the top management professionals' decisions and may provoke errors or not. Hence, they may be related to the communication difficulties in the multiprofessional team, inappropriate use of the infusion pumps, lack of institutional standards and routines, lack of material resources, inappropriate inputs and lack of maintenance.

These events are associated with human, material and structural resource management as, without appropriate management, safe and high-quality care cannot be foreseen and provided.

In a study developed at a hospital in Chile, it was highlighted that inappropriate management can lead to the occurrence of errors and adverse events, highlighting the deficit in the compliance with institutional standards and routines, in the surveillance of nursing care and lack of professional experience as the main factors that can contribute to these events⁽¹⁷⁾.

What multiprofessional team communication is concerned, the heterogeneity of the group is highlighted, which can be positive or create difficulties and conflicts, influencing successful and cooperative learning and relationships. It is fundamental for the heterogeneous group to turn into a team, with shared goals and

objectives, gaining fluency in the communication process among all members.

A research in the aviation industry showed that most plane accidents were related to communication and teamwork faults. Thus, *Crew Resource Management*, a program that aims to improve the airway safety in the global context, prioritizes teamwork training, reducing human errors during flights. The report of the *Institute of Medicine* (IOM) supports this assertion, highlighting that better teamwork reduces errors in the health system⁽¹⁸⁻¹⁹⁾.

The inappropriate use of infusion pumps is associated with the need for training of the nursing team and with the establishment of institutional standards and routines. Thus, the managers can stimulate the safety culture, besides enhancing the stakeholders' dialogue and group work skills, so that some problems can be addressed, such as the appropriate use of IPE and hand washing.

Concerning the bad-quality furniture and inputs and the lack of maintenance, it is important to highlight how stressful these factors are to the nursing and multiprofessional teams, affecting the care provided and increasing the institutional spending. Nevertheless, it is highlighted that the nursing team plays a fundamental role in the management and use of these resources, besides being the main workforce at the institution⁽²⁰⁾.

The data analysis revealed that the nursing team acknowledges the occurrence of human error in daily care. Daily life is the life of all humans, in a heterogeneous, hierarchical, spontaneous, economic way and based on provisional judgments⁽²¹⁾.

Errors in daily nursing care can be related to the alienation from daily life, when the individuals simply do their job in the social division of work, a common fact at the ICC, given the mechanization of the activities. Hence, the alienated individuals stop participating in the activities consciously, and may commit errors, whether harmful or not, but which will affect the patient safety.

Conclusion

This study revealed the main errors in daily nursing care according to the team. Among the most common errors, those related with unsafe acts stood out, such as the lack of medication verification and the inappropriate use of IPE; and those associate with the institutional system, such as the low quality of material inputs and the lack of institutional standards and routines.

The theory of human error permitted understanding that the identified errors are complementary and that they do not happen in isolation. Thus, it is fundamental to highlight that both the institution and the employees are directly involved in the events. Nevertheless, more important than blaming is knowing and acknowledging the error, treating it appropriately and stimulating the adoption of preventive measures, besides demystifying the safety culture.

Among the study limitations, the difficulty to hold the interviews is highlighted, given the work burden and the reduced number of professionals in the study context.

These research results are related to a reality. It is important to replicate the study at other institutions, which will certainly contribute to the acknowledgement and prevention of errors in all activity areas of the nursing team.

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