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REVISTA IBERO-AMERICANA DE SAÚDE E ENVELHECIMENTO
REVISTA IBERO-AMERICANA DE SALUD Y ENVEJECIMIENTO

NURSING CARE AND ADVERSE EVENTS AT INPATIENTS IN ACUTE HOSPITALS:
THE ROOT CAUSE ANALYSIS

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VOL. 2 N.º 2 AGOSTO 2016

RESUMO

Purpose: Aims to characterize the main adverse events associated with the practice of nursing, in hospitalized patients and understand how different circumstantial facts interact in its occurrence. **Methods**: This is a qualitative study using semi-structured interviews. Were interviewed 18 nurses, working in the hospital unit. The reports were analyzed following the adverse event analysis model, proposed by Chang, Schyve and Richard[1]. **Results**: Reports show a wide variability of error types, emphasizing medication errors, falls, errors of omission and commission in performing nursing practices, such as gaps in surveillance, clinical judgment, respect for privacy and advocating the patient' interests. We identified the chain of human and systemic factors that intervened in the route events. The results warned the possible association between the occurrence of adverse events, less suitable nursing practices and unfavorable work environments. **Conclusions**: The results support the need for more leadership commitment to safety, improvement of human and material resources, coordination and communication between different professionals and services, training of professionals on risk management and patient safety, as well as greater development of safety culture.

Keywords: patient safety, nursing, risk, leadership

INTRODUCTION

The patient safety, particularly the occurrence of adverse events (AEs) in health care is a growing concern of health organizations and all stakeholders of this sector, recognized as priority and essential area of health quality.

Nurses have a privileged position in the provision of a safe health care to patients, but this position puts them simultaneously on the path of adverse events[2].

This study aims to characterize the main adverse events associated with the nursing practice and understand how different environmental factors interact in its occurrence. It discusses the complexity and defines strategies for organizational learning.

Theoretical background

An adverse event (AE) has been defined has been defined by several authors as an undesirable effect of health care, either by failure or omission in the provision of care.

Studies in several countries, such as those developed in Canada[3], Brazil[4], Spain[5] and Portugal[6] indicate an incidence rate of AEs in patients hospitalized between 7.5% and 16.6%, considering that about half result from preventable failures.

The WHO, recognizes that the full extent of the problem requires a concerted international action, which allows learning and collaboration between the different countries, advocating that despite the specificities of each country, the different studies reveal that many of the problems arise from common causes. Despite this theme's inclusion in the international agenda, this problem is far from being solved[7].

The literature is unanimous in considering that the provision of health care in a hospital is developed in a complex and adaptive system where professionals make decisions, act and are not immune to error. In this context, although the safety of care has multi-professional responsibility, it is recognized that the nursing profession plays a key role in the development of health care insurance, since nurses manage many environmental factors, care for the sick during 24 hours, assure continuity of care during hospitalization, co-ordinate their activity with various professionals and provide the most direct patient care (Because their position in direct contact with patients and other health professionals, nurses play important role in the continuous improvement of environmental practices and cares. In this sense it is important to be able to discuss the errors, without fear of the consequences, either disciplinary action or loss of professional image[8,9].

The *European Nurse Researchers Work Group* recommends that research should capture the environmental and human context of error, including the particular experiences of those who have made errors[10].

METHODS

The research focuses on the study a particular phenomenon, the AEs and the circumstances surrounding its occurrence in a given context. We chose the interpretative paradigm, favoring their understanding. These approaches have the intention of understanding "the world of human experience"[11]. Angen[12] argues that notion of reality is constructed through our inter-subjective experiences within the lived world, suggesting, as Mertens[13] that "the reality is socially constructed". In that perspective, the researchers assumed that reality is interpreted intra and inter-subjectively, through the meanings from the social world[12].

The qualitative analysis was performed using semi-structured interviews which focused on a critical incident experienced or observed by the nurse who was being interviewed.

Sampling and Data collection

The inclusion criterion was being a nurse with professional experience in inpatient settings. Our sample was composed of nurses attending the postgraduate studies in nursing of the Nursing School of Coimbra (ESEnfC). This group of nurses was chosen because they had different professional experiences (a minimum of 2 years), they worked for different institutions and they were away from their work environment, which allowed them to discuss this issue without the fear of individual accountability. The interviews stopped when we perceived that contents were being repeated. Eighteen nurses participated in the study (13 females and 5 males), with a mean age of 34.13 years, and 11.32 years of professional experience.

In our study, an adverse event is "any type of incident, accident, error or deviation from the norm that can cause an injury to the patient". We asked each participant to describe a situation that had occurred with an hospitalized patient in their service, which could be considered a nursing-related adverse event. Nurses were asked to describe what had happened, the impact on the patient, the professionals involved and the organization, the causal factors (errors of the human system and of the organizational system), and the interventions or recommendations to prevent/correct similar situations. Nurses were also encouraged to explore other aspects that they considered relevant to understanding the event.

Ethical considerations

Ethical concerns are essential to the development of research processes which involve humans[14]. Thus, during the investigation we have respected the ethical principles inherent to research, as well as stated in the *Code of Ethics for Nurses*. This research project was approved by the Ethics Committee of the Health Sciences Research Unit- Nursing, through assent nº P13-12/2010. The research was authorized after a formal request to the president of the ESEnfC. Participants were informed about the objectives of the study and data collection methodology, including the use of interview recording. Data confidentiality was assured and a formal consent to participate was obtained.

Data analysis model

Recognizing the importance of using a standardized language and methodology, the reports were analyzed based on the *Patient Safety Event Taxonomy* (PSET). This model was developed by the Joint Commission on Accreditation of Healthcare Organization (JCAHO). According to WHO experts, it has a hierarchical structure, is scalable and enables knowledge discovery. The taxonomy has five complementary root nodes (type, impact, domain, cause, prevention and mitigation) and it can capture narrative data on the incident, ordering complex information in a logical and reproducible fashion[1].

Figure 1 presents the model of report analysis, which follows the method of *root cause analysis*, with five complementary root nodes: the **type of event**, the **impact**, the **domain**, the **cause** and the **prevention and mitigation** of damage.

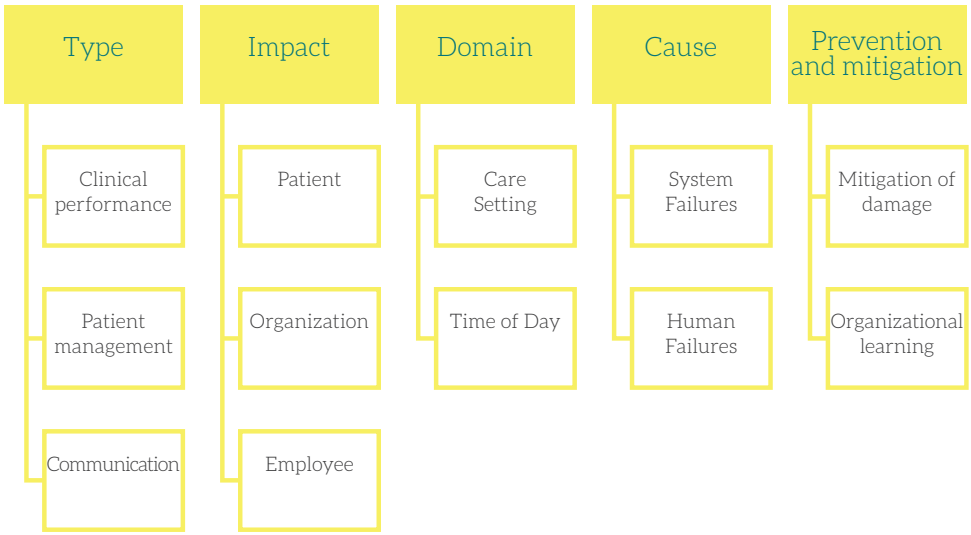

Figure 1 – Analytical model adapted from JCAHO patient safety event taxonomy (Chang, Schyve, Richard *et al*, 2005).

The information, collected into audio support, was later transcribed into Word document. Content analysis was performed using Bardin's method[15]. After a fluctuating reading of the reports, the analysis was carried out based on the five root nodes and different categories were created for each of these units. A panel of four researchers, PhDs and Masters in different areas of nursing, namely medical-surgical nursing, rehabilitation nursing, mental health nursing and nursing fundamentals, was created to ensure inter-rater/inter-judge reliability in interview codification. An agreement of at least 75% of inter-judge reliability was created as a category and sub-category acceptance criterion, with no significant discrepancies. Data was organized using Nvivo 8 software.

RESULTS

Here are the major findings in each of the five root nodes.

Type of event

Events are usually described as process failures in the **professional's clinical performance**. However, these failures are usually associated with failures in the **management processes** and in **communication**.

As we can see in Table 1, reports highlighted a wide range of errors, such as medication errors, falls, errors due to omission and commission in the performance of nursing practices, in particular failures in surveillance, in clinical judgment, in the respect for privacy, and in the advocacy of patients' interests (family). Reports also identified omissions of organizational procedures with a potential negative impact on the patient.

Different types of medication errors were reported, such as wrong dosages, drugs, patients and routes of administration. After analyzing the stages of the process, we concluded that most of the errors occur at the moment of administration. However, some of the failures were also observed in the preparation and storage of drugs in the hospitalization unit.

Failures in patient surveillance, clinical decision and patient's advocacy have emerged in many reports. Nurses believe that these failures may have contributed to worsen the patient's clinical status, namely after a surgery, as one of them says: *"The patient had just come from recovery. We didn't take the initiative of putting him in a nearer bed to better monitor his/her progress. ... when I called the doctor, it was difficult to justify what had happened and to explain the worsening of the patient's situation"* I9.

Nurses appreciate their professional duty of supporting patient and family rights, namely the right to privacy, information, and proper health care provision, but they also recognize that they have difficulties in taking on the role of patient advocates. As one nurse says: *"It is a type of care that is ours, but in some situations it is impossible..."* I8.

Some failures in the performance of organization procedures were reported, which have jeopardized patient safety, as in this example: *"when we turned on the patient's ventilator, one of the tubes wasn't connected. ...I didn't check the material correctly"* I15.

Most reports refer that failures are usually related to individual performance but, at the same time, they also identified failures in management and communication.

In the **management processes**, active failures were identified, such as failures in patient management (admission and discharge) and in the follow-up and supervision of students and professionals being integrated into the teams, as in that examples: *"That patient had come in the afternoon and was not assigned to a nurse, in the distribution"* E1; *"The problem is the student to have gone alone"* E7.

Reports have also shown that when there is an incident there are usually **failures in communication** involving different professionals and different types of communication, both in terms of oral and written information.

Table 1- Types of error involved in the described event

Category	Subcategory	Theme/Developed Action	Participants
Failures in clinical performance	Medication error	Storage	I6
		Preparation	I2, I14, I17
		Administration	I4, I7, I13, I16, I18, I19
	Patient fall	Failures in risk assessment and adoption of preventive measures	I12
	Failures in surveillance and Advocacy	Failures in surveillance and clinical decision	I9, I17
		Respect for the wishes of the patient / family	I10, I11
		Privacy	I8
	Omission of organizacional procedures	To send samples to the laboratory	I3
		Prior material check	I15
Failures in management processes	Patient management	Patient admission and transfer processes	I1, I4, I5
	Follow-up and supervision	Student Guidance	I6, I7
Failures in communication	Oral communication	Between professionals	I3, I9, I13, I16
		With the family	I10, I11
	Records	Lack of timely records	I3, I13

Impact

The impact on the patient can be physical, mental and social, and its severity can range between absence of injury, mild, moderate, severe injury and death (Chang, Schyve & Richard, 2005).

Although reports mention some psychological and social impact, as shown in Table 2, they mainly focus on the consequences on the physical function. Injuries were temporary, i.e. remedial measures were taken and the situation was reversed. Despite a significant number of events having resulted in an absence of injury or mild injury, some patients suffered a moderate or severe impact. These situations resulted in higher costs for the patient (changes in the cardiorespiratory function, trauma, pain, allergies) and more complex interventions, such as drug administration and the intensification of vigilance. Some situations had a more severe impact: patients suffered changes in their vital functions which led to emergency interventions by the team or to the patient's transfer to an intensive care unit, as in this example: *"The patient was in a critical condition. ... we needed to aspirate and the situation became so complicated that we had to activate emergency proceedings."* I9.

While analyzing the **impact on the professional**, we concluded that most participants identified the incident as a very negative experience. They feel responsible for what happened and they feel that they have failed as a professional group, even in cases in which the situation was not directly related to them, but to another professional. Nurses express distress, disorder, anguish and fear for the consequences on the patient. The feeling of guilt is very common in the reports, as one of them says: *"When I realized I had made a mistake, I had a feeling of anguish. What have I done? How did I do it wrong? Why wasn't I paying more attention?"* I19.

The failure by a professional who works within a team is usually perceived as a failure that affects the image of the group and the relationship within the team. Thus, the negative impact is perceived as both an individual experience and a group experience, as in this example: *"The team feels bad, because it was another error, and those errors weren't common in that service. We were sad and worried... this had an impact on the team."* I14.

When events happened with students, the nurse who was supervising the student felt that it was a double failure, i.e. the nurse is letting down the patient and the student.

Together with the concerns regarding the patient, sometimes professionals also fear organizational reprisals. However, it is clear that the feeling of responsibility is stronger, encouraging nurses to share what has happened and to ask for help to mitigate damage.

At an **organizational level**, adverse events increase the need for more surveillance, additional medication, extension of hospital stay, and mobilization of more resources, such as emergency teams and/or hospitalization in intensive care units, resulting in a more intensive use of material and human resources, as was described by one of the nurses: *"the patient was more or less stabilized, had to be intubated and was sent to resuscitation..."* I9.

Table 2 - Characterization of the impact of reported events

Category	Subcategory	Participants
Impact on the patient	Damage to the physical function	Sem dano: I2, I3, I4, I15,
		Mínimo: I1, I6, I8, I19
		Moderado: I12, I16, I18
		Severo: I9, I13, I14, I17
	Damage to the psychosocial function	I5, I7, I16
	Damage to the family	I10, I11
Impact on the professional	Negative individual experience	I1, I2, I3, I4, I6, I7, I13, I14, I15, I16, I19
	Negative experience in the relationship with the team	I8, I9, I10, I11, I12, I14
	Negative experiences in the relationship with the organization	I6, I16
Impact on the organization	Increase in human resources allocation and in material consumption	Moderado: I3, I4, I12, I16, I18, I19 Severo: I5, I6, I9, I13, I14, I17

Domain

By analyzing the domain we can characterize the circumstantial aspects in which incidents occur. Taking into account the study objectives, we have only focused on the **professionals involved** and on the **time of the day**.

As can be observed in Table 3, a significant number of events occurred with students and nurses who were less experienced in the service, indicating that inexperience can expose the professional more to this type of incidents.

While analyzing the available information on the *time of the day* in which the event occurred, the so called "transition periods" emerged as particularly critical. Due to the overlapping of activities occurring at the end of the shift, nurses have less time and mental availability, compromising the provision of care, namely surveillance and communication, as was explained in this report: *"We reached a point in which, when the shift ends, everything has to be done... situations which are apparently not complicated become complicated... at that moment, you're doing other thinks...therapeutics, records..."* I9.

On the other hand, patient transfers, namely less stable patients, for example immediately after a surgery, are also critical moments.

Table 3- Characterization of the domain where the reported events occurred

Category	Subcategory	Theme	Participants
Professionals involved	Professional group	Only nurses	I1, I2, I3, I4, I19, I8, I9, I10, I11, I12, I14, I15, I17, I18
		Nurse/student	I6, I7
		Nurse/doctor	I5, I13, I16
	Little experience in the service	Students	I6, I7
		Nurses	I1, I3, I5, I9, I14, I17
Time of the day	Shift	Morning	I1, I2, I3, I4, 10, I12
		Afternoon	I5, I6, I7, I9, I16, I17
		Night	I19, I11
		No information	I8, I13, I14, I15, I18
	Transition	Shift change	I1
		End of shift	I9, I10, I11, I12, I19
		Beginning of shift	I4, I17
		Recently admitted patient	I1, I4, I9, I17

Cause

Reported incidents underlined failures in clinical performance as proximate causes of an event, highlighting that the human factor was always present. As shown in Table 4, human failures were divided into four main categories: **Team communication**, **professional competence**, **functional difficulty** and **professional engagement**.

Failures in communication were determinant factors which were directly associated with adverse events. In several reports it became clear that communication failures were not only at the beginning of the error mechanism, but also that they allowed for its development, as is illustrated by the following example: "*there was a communication failure between the two nurses and between the doctor and the nurses, ...usually, the doctor says I have already asked your colleague but he hasn't yet... would you mind going there? And we check with the colleague.*" I13.

Failures in knowledge or professional skills were associated with a lack of professional experience and they suggested less proactivity in the resolution of new or more complex situations, as is explained in this report: *"nurses takes a long time to become an expert. ... in a service with the dimension and the complexity of care... a new graduate is thrown to the wolves."* I9.

Factors such as fatigue, stress, lack of attention, complacency, inertia, lack of motivation or professional engagement, among others, were also mentioned.

Table 4 – Synthesis of human factors which intervene in the reported events

Category	Subcategory	Participants
Team communication	Quality of information	I1, I3, I9, I13, I16
	Assertiveness	I8, I10, I11
Professional competence	Inexperience	I3, I6, I7, I9, I10, I13, I14, I17
	Over-confidence	I4
Functional difficulty	Stress	I6, I19
	Fatigue,	I19
	Lack of attention, facilitation	I2, I4, I6
Professional engagement	Lack of motivation, Disenchantment	I5
	Inercia, disinterest	I5, I10

Nurses humbly talked about their weaknesses and admitted their fragilities, while identifying the human factors as proximate causes of the incidents. However, nurses often showed their conviction that many of these frailties were due to organizational factors which conditioned their performance, as shown in Table 5.

The **composition of the teams** was identified as a major issue in every report. The participants identified the lack of human resources and the team's instability as the main problems in team composition. They associate these factors to the excessive mobility of professionals, not only because of recruitment policies based on job instability, but also as a result of allocation policies within organizations.

The lack of nursing staff, which has an impact on the work overload, particularly during some specific times of the day, was considered as one of the most important factors in the occurrence of adverse events. Nurses feel that the under allocation of resources makes them work with unnecessary haste, leaving them often with no time to reflect on their interventions and more prone to errors *"Frequently, there is a human resources deficit, which*

may lead us to do things without questioning ourselves on what we are doing. This need to quickly provide care is likely to make errors happen." I2. Professionals mentioned that under allocation and instability in the nursing teams reduce the capacity for a safe response in contexts of work overload, unpredictability and some confusion. In this context, the admission of new professionals, represents an added risk because the integration programs are often too short and professionals are impelled to take on responsibilities that their lack of experience has not yet allowed them to develop, as is shown by this example: *"Now, with team turnover, because we really are a very young team. It hasn't been easy at all. They have a minimal integration period... they don't even become aware of the priority definition. The interventions that can wait, and those can't."* I13. The major role of organizational policies in team composition was identified. But above all, the importance of leadership in aspects related to skill training and development were highlighted. Leadership failures were highlighted, particularly during the integration and follow-up of new professionals and when promoting change, as the following example shows: *"change means more work. In order to avoid some work overload we would let things slide. "... The head nurse had to be aware of these things and have taken other decisions, which did not."* I5.

Almost 95% of the participants relate failures involving the **organization of care**. This includes aspects related to how nursing activities are designed and organized, which reflects in the functioning of the services, influencing the work practices. Most reports referred that, although the services have formally established methods of work organization focused on individualized care, they often feel the need to breaking down several safety rules in health care provision, such as that it is not always the professional who prepares the medication to administer it, and as well not always the one who records the procedures to have performed them: *"during the afternoon shifts, it sometimes happens that one nurse prepares it for her patients, then she is busy due to some unpredictable circumstance and has to leave, to accompany a patient, for example, and another nurse administers it."* I7.

Nurses are often interrupted in their activities and priorities are changed as a result of permanent interaction with the patient, family, physician or other members of the team who, when faced with unpredictable situations, ask nurses to solve them, as the following report states: *"A service with a great influx of patients, very disorganized in terms of care management... Sometimes the nurse, in addition to their patients also has to help an outpatient in a renal biopsy ... and when returning to their patients already happened many things ... it's very confusing."* I3.

Some participants underline structural problems in the services, which make the professionals' work and surveillance more difficult. Very distant, small and poorly organized rooms are some of the structural aspects referred to as factors which hamper a successful

surveillance and/or preparation of medication, as this example: *"Units are often very poorly prepared... for who is ill, of course, but also for those who work there..."* I8.

Although we cannot confirm that the physical conditions are directly associated with the occurrence of safety events, we can infer that this lack of conditions hinders the professionals' work and contributes indirectly to increase the risk.

Prevention and mitigation of damage.

When analyzing how teams learn from their mistakes, we concluded that, even though the problem was discussed by the team, in most cases the focus of analysis was still the professional's practice, and that there wasn't practically any discussion on the organizational or systemic circumstances involving these incidents, as we can see: *"After the shift change, we very quickly talked about what had happened... It just happened. We solved it and it was over, as if nothing had happened. I think it could have been an opportunity to rethink the way it is distributed, but no."* I1.

Almost all professionals acknowledged that many of these events could have been prevented and they suggested improvement measures aimed at the professionals, human resources management, process management, the physical structure and the allocation of material, which, as a whole, can improve the conditions for professional practice.

Table 5 – Synthesis of the systemic factors identified in the reported events

Category	Subcategory	Participants
Team constitution	Staff deficit: Work overload	I2, I7, I9, I12, I15, I16 I13, I19
	Instability: turnovers and transfers	I9, I13
Leadership	Inadequate integration	I3, I9, I13
	Failures in follow-up and supervision	I6, I7
	Lack of support and incentives to change	I5, I12, I16, I19
Care organization	Failures in the implementation of the working method	I1, I2, I4, I7, I12
	Disorganization in working processes	I3, I5
	Interruptions	I2, I7
	Interaction with other professional groups and services	I5, I11, I13, I19
	Routine practices of the group	I2, I4, I7, I12, I13
Ambiente físico	Estrutura espacial	I2, I7, I9, I17
	Materiais	I8, I12, I17

DISCUSSION

Respecting the ethical-deontological values and principles, nurses take on the responsibility to provide quality care to the patient/family that trusted them and as highlight other studies, demonstrate willingness to reflect on security incidents[16,17]. It is undeniable that failures occur in nursing practice, with the potential to cause harm to the patient. We can´t ignore this reality in safety promotion strategies, as has also been shown in other studies[2,16,17].

Although AE has been associated with less safe work practices, as has been noted in other studies[16,18], when the error occurs, the concern of nurses focuses on harm reduction and prevention of complications, not hesitating to request help from other professionals.

Omission errors were identified (surveillance, clinical judgment, advocacy, performance of procedures, records, ...) and commission errors (errors in preparation and administration of medication, ineffective communication, inadequate supervision, ...).

All nurses identified the event as a clinical performance error, taking professional responsibility for its occurrence. However simultaneously identify gaps in communication and failure in management processes, as have postulated several authors[2,19].

As noted in other studies[2,18], the less appropriate context in which the nurses' activity is developed seems to influence the response of each professional and team to the daily challenges, and it is more prone to the occurrence of adverse events.

Therefore, professionals felt that their work overload and the need for a fast response often led to situations of fatigue, stress or lack of attention, which affected their ability to intervene in a more adequate way. Wear led some nurses to professional disenchantment, lack of motivation and less professional engagement, with negative effects on a more proactive attitude towards safety. In this context, quality and assertiveness in communication processes are often compromised and constitute additional factors to the error path. When we analyze the context where the events occurred, we verified that in about 40% of the cases, less experienced professionals were involved. This suggests that less experience associated with a less efficient integration can reduce the capacity to manage more complex situations. These results, as suggested by Palese *et al.*[20], indicating that managers should pay a special attention to team stability.

Carayon and Gurses[21], consider that the workload is influenced by staffing, the characteristics of the patient and also by the work system design, arguing that if is often not possible modify the first variables, it should give more attention to improving work environments.

The nursing leadership may play a very important proactive role, not only in the development of more favorable contexts of safe professional practices, but, above all, in the strengthening of a safety culture which fosters learning from mistakes[22,23,24].

CONCLUSION

Results show that, there are still incidents in the nursing practice which may harm the patients, emphasizing the need to understand the interaction of human and systemic factors that contribute to their occurrence. Results point to the need of a systemic approach, especially in what concerns the constitution of the teams, the organization of working processes, particularly at the end of the shifts, the way patient transfers are carried out, and the factors that affect work interruptions. It also underlines that nursing managers should be able to identify the negative impact of adverse work conditions on the professionals' stress levels, motivation and engagement, suggesting a particular attention to the prevention of these factors.

Surely the way to transform the health institutions in more secure organizations involves greater commitment to safety culture and the development of a leadership that encourages the risk management in an integrated action.

Study limitations

We recognize some limitations in the present study, namely in the sampling. We limited the analysis to nursing perspective, but admit that the analysis would benefit from a multiprofessional look.

We also consider that when we focus the interview on the description of a significant event, limit the type of described events. Situations in which the linearity between the action of the professional and the patient outcomes is less obvious, such as infections associated with health care or pressure ulcers were not reported and require another approach.

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