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Nursing in critical care: the perception of errors and risk management

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Abstract

Objectives: Safety culture refers to the summary of perceptions that employees share about the safety of their work environment. We sought to identify the most frequent errors occurring in critical care area and the related contributing factors perceived by critical care nurses.

Methods: A questionnaire was filled anonymously by a convenience sample of 220 critical care nurses. The first five questions aimed to explore the hospital's risk management organizational structure. The following seven questions investigated the nurses' perceived causes of adverse events/near misses

Results: The mean number of reported errors is 3.5±1.6. The most frequent reported categories of errors are: the drug related errors (n=269, 34%), errors in the management of medical equipment (n=190, 24%) and procedural errors (n=123, 16%). The most frequent perceived causes with a great" impact on adverse events/near misses were: 1) communication's problems (n=62, 28.2%), 2) lack of structures (n=54, 24.5%) and 3) problems of "leadership" (n=49, 22.3%).

Conclusions: A planned strategy of improvement needs to be created to clarify problems, undertake improvement actions and strategies that will help the team to work safely.

Key-words: patient safety, nursing, critical care, errors.

Introduction

Patient safety is an essential and vital component of nursing care. In fact, in helps to identify potential risks, to learn the proper terminology to describe and categorize health care errors, thus promoting safe care[1].

The position statement of the International Council of Nurses (ICN) on patient safety[2] underlines the role of nurses in addressing patient safety in all aspects of care. In particular, nurses has to: 1) inform patients and families of potential risks, 2) promptly report adverse events to the authorities, 3) take an active role in assessing the safety and quality of care, 4) improve communication with patients and other health care professionals, 5) advocate for positive practice environments and 6) promote rigorous infection prevention and control programs.

In addition, the patient safety and quality have not been part of the nurse's education[4-5] in the past. Nonetheless, at present, nurses have a much more pro-active role, as pointed out by the Future of Nursing report's[3] recommendations on nurse education, research and leadership, which underline the expanded role of nurses in improving patient safety.

Moreover, the position paper of the European Federation of Nurses (EFN) on patient safety[6] encourages nurses to develop a systematic collection of data and communication of research findings. This represents an open learning culture where immediate reporting of mistakes is encouraged and incidents are widely communicated without fear of "name and shame" thus promoting patient safety at all stages and in every aspect of patient care.

The critical care setting is one of the most complex environments in a health care. Critical care units must manage the intersecting challenges of maintaining a high-tech environment and ensuring staff competency in operating the equipment, providing high-quality care to the sickest patients of a health facility and attending to the needs of staff members working in a very stressful environment. Patients in intensive care units (ICU) are at risk complications due to the severity of their medical conditions, the complex and invasive nature of treatments and the use of drugs and applied technology. Therefore, in ICU setting, patient safety require a focus commitment at all organization's level; yet nurses serve as the bedside safety advocate with the opportunity to put theory into practice[7].

This study focuses on patient safety in the settings of nursing critical care and is intended, therefore, to: a) identify the most frequent errors occurring in critical care area and the related contributing factors perceived by critical care nurses, b) propose improvement solutions to enhance patient safety in critical areas.

Methods

Survey questionnaire

The survey questionnaire was reviewed by a focus group (n=5) and revised based on the suggestions coming from a pilot study on 20 samples. The questionnaire was filled anonymously by a convenience sample of 220 nurses working in critical care areas and was composed of 12 questions. The first five questions aimed to explore the hospital's risk management organizational structure. The following seven questions investigated the nurses' perceived causes of adverse events/near misses and three areas were considered: 1) resources' supply (2 questions), including nurse staffing, materials and equipements; 2)

technical skills (1 question) and 3) non-technical skills (4 questions), including team-working, communication, leadership and decision making8 (Table 1).

Table 1. Perceived causes of adverse event on near misses.

	Impact on adverse events*		
	Mild	**Moderate**	**Great**
	n (%)	**n (%)**	**n (%)**
Lack or resources (Organization problems)			
- Inadequate sizing of nurse staff	97 (43,7)	79 (35.9)	45 (20.5)
- Lack of structures	90 (40.9)	76 (34.5)	54 (24.5)
Lack of technical Skills			
- Lack of technical skill	120 (54.6)	79 (35.9)	21 (9.5)
Lack of "non-technical skills"			
- Comunication problems	58 (26.4)	100 (45.5)	62 (28.2)
- Team working problems	125 (56.8)	65 (29.5)	30 (13.6)
- Problems of "leadership"	108 (49)	63 (28.5)	49 (22.3)
- Lack of "decision making"	105 (47.8)	79 (35.9)	36 (16.4)

*: of nurses by using a 3 points Likert scale

The second part of the questionnaire included a list of the most common categories of clinical errors (n=6) as identified by the Italian Ministry of Health. Each category of errors is further divided into subcategories to identify a total of 27 error's types (Table 2) [9]. We asked nurses to pick out the most frequent 5 errors occurred during the last 6 months in their critical care areas.

Eventually, we asked nurses for demographic information such as job settings (operating room, intensive care unit), age (divided in 4 groups as ≤35, between 36 and 45 years, between 46 and 55 and >55 years of age), sex and level of education on risk management (the number of course attended on clinical risk management, as none, 1-3, 4-10, >10 curses).

Table 2. The most frequent reported category and subcategory of errors (n=787).	
Category of errors	**n. of errors (%)**
Category E1 - Drug-related errors	**269 (34%)**
- Prescribing errors	**121 (15.4%)**
- Preparation errors	24 (3%)
- Transcription errors	53 (6.8%)
- Deployment errors	5 (0.6%)
- Administration errors	55 (7%)
- Monitoring errors	11 (1.4%)
Category E2 - Surgical errors	**85 (11%)**
- Foreign bodies in the surgical outbreak	18 (2.3%)
- Surgery on the wrong site	11 (1.4%)
- Improper surgical	2 (0.3%)
- Surgery is not necessary	8 (1%)
- Improper management of the surgical patient	**46 (5.9%)**
Category E3 - Errors in the management of the equipment	**190 (24%)**
- Malfunction for technical problems	**90 (11.4%)**
- Malfunction due to the user	31 (3.9%)
- Use in inappropriate conditions	17 (2.2%)
- Inadequate maintenance	15 (1.9%)
- Instructions inadequate	29 (3.7%)
- Use beyond the limits	8 (1%)
Category E4 - Procedural errors	**123 (16%)**
- Not performed	16 (2.1%)
- Planned but not performed	**52 (6.6%)**
- Carried out incorrectly	27 (3.4%)
- Performed appropriately but on the wrong patient	12 (1.5%)
- No appropriate procedure	16 (2%)
Category E5 - Timing errors	**110 (14%)**
- Delay in drug treatment	**47 (5.9%)**
- Delay in treatment	32 (4.1%)
- Delay in diagnosis	12 (1.5%)
- Other delays (Organization, Logistics)	19 (2.4%)
Category E6 - Transfusional errors	**10 (1.3%)**

Statistical analysis

Descriptive analyses were performed to ascertain the proportion of nurses selecting a particular response option. The response scale of the first five answers was dichotomous (yes/no) and a score was assigned to each answer (yes=20 and no=0). The results were then summed to reach a maximum score of 100 for each participant indicating the risk management organizational structure score.

The following seven questions were evaluated by using a 3 points "Likert-scale", with 1 indicating "mild" impact and 3 indicating a "great" impact on adverse events/near misses.

Categorical variables were considered as absolute frequency and percentage. Quantitative variables are summarized as mean and standard deviation (SD). Where quantitative variables were not normally distributed (assessed by Shapiro-Wilk normality test), comparison among groups was carried out using the Kruskal-Wallis test. Categorical variables were compared using the χ^2 test or Fisher's exact test as appropriate. All reported p-values are two-sided and a significance level of 0.05 was used. Statistical analysis was performed using SAS software.

Results

The convenience sample was composed by 180 female (82%) and 40 male (18%) nurses; 83 of them were below 35 years of age (38%), 96 between 36 and 45 years (44%), 32 between 46 and 55 years (14%) and 9 above 55 years of age (4%).

Regarding the first 5 questions of the survey (concerning the risk management organizational structure), the majority of nurses stated that a formalized system for clinical risk management exists in their facilities (n=171, 78%). In addition they said that a training on clinical risk management have been provided (n=158, 72%) and that professional figures in the field of patient safety exists in their hospital (n=118, 54%). Furthermore, 155 (71%) nurses asserted that guidelines/protocols are in use in their units and 124 (56%) nursed asserted that risk management ministerial recommendations are currently followed. Regarding the level of education on risk management (as the number of courses attended on clinical risk management), 134 nurses (61%) attended between 1 and 3 courses, 20 (9%) between 4 and 10 courses and only 2 (1%) more than 10 courses. Sixty-four nurses (29%) did not attend any course. There is a linear association between the risk management organizational structure score and the nurses' level of education on risk management (the number of courses attended on clinical risk management) (p=0.004).

The results of the following seven questions of the survey (investigating nurses' perceived causes of adverse events/near misses) are listed in Table 1. The four most frequent perceived causes who were considered to have a great" impact on adverse events/near misses were: 1) problems of comunication (n=62, 28.2%), 2) lack of structures (n=54, 24.5%) and 3) problems of "leadership" (n=49, 22.3%), 4) inadequate sizing of nurse staff (n=45, 20.5%)

The mean number of reported errors is 3.5±1.6. The most frequent reported categories of errors are: the drug related errors (n=269, 34%) followed by the errors in the management of medical equipment (n=190, 24%) and procedural errors (n=123, 16%)(Figure 1). The most frequent reported category and subcategory of errors and the different perception of errors are listed in Table 2.

Male nurses reported more errors than females (means of 4±1.5 versus 3.4± 1.6, p=0.01). The

number of reported errors was independent on the level of education on risk management (number of courses attended on clinical risk management) and on the risk management organizational structure score.

Discussion

During the last two decades, the international scientific community has focused more and more on safety in healthcare. A report from the Institute of Medicine "To Err is Human"10 published in 2000, estimated that the errors in health care are the cause for 44,000 to 98,000 deaths each year, in the United States. More recently, HealthGrades11 reported that, from 2004 to 2006, 238,337 estimated deaths were the result of potentially avoidable medical errors.

The essentiality of placing the issue of patient safety at the center of healthcare organizations has being increasingly supported by studies and evidence of cost-effectiveness of specific interventions for health quality improvement12. Kiekkas and colleagues[13] stated in 2012 that "Knowledge is power", and therefore it is essential to study critical incidents in intensive care with the aid of a specific taxonomy. In their prospective observational study Bracco et al[14] had identified that adverse events were due 2% to technical failure and 67 % to secondary to underlying disease. Furthermore they found 241 human errors (31%) in 161 patients, evenly distributed among planning (n=75), execution (n=88), and surveillance (n=78) errors.

On the other way, Welters et al[15] identified 5 categories of errors where a reporting system was used and the most frequent errors were the followings: equipment 338 (30%), clinical practice 257 (22.8%), pharmaceuticals 238 (21.1%), administration 213 (18.9%), health and safety hazards 81 (7.2%).

According to the results of this study the majority of nurses (>70%) affirmed that in their facilities exists a formalized system for clinical risk management and that they usually follow institutional guidelines, protocols and Ministerial recommendations in their routine clinical practice. In addition, an association was found between the institutional risk management framework and the education's level of critical care nurses, which means that culture on patient safety is currently actively promoted. Nonetheless, in this study, around 30% of the nurses in critical areas in this study didn't attend any course on clinical risk, which means that there is a lack of involvement of these figures in the planned training and learning activities promoted by the hospital clinical risk managers.

There have been 787 errors indicated by nurses occurring, during the last 6 months of their clinical practice (a mean of 3.5 errors for provider), being the category of drug-related errors the most reported, followed errors in the management of medical equipment and procedural errors.

Interestingly, the number of errors reported is independent on the level of education on risk management (number of courses attended on clinical risk management) and on the risk management framework (risk management organizational structure score).

Hospital training on clinical risk is fundamental; however, it must be dynamic and must be aimed to solving current practical problems. Therefore, the learning of new skills, non-technical skills, and organizational techniques will help the professional to deal with the new situation in its specific operating environment. In addition it is a precondition for individuals and groups to acquire and refine the ability to self-organize and take the full responsibility for the quality of their work.

Besides being an "undertaking the work," the nurse becomes a "lender of intelligence" because of his qualifications and professionalism.

We confirm the results of previous reports Carayon[16] and Holden et al[17] in organizational problems which were perceived by nurses to play a crucial role in the occurrence of these errors. The study of Holden[17] shows, in fact, how the workload of the nursing staff and the lack of adequate number of resources affect the results in terms of quality and care.

Furthermore, as reported by the Joint Commission in 2009[18], a miscommunication between operators may lead to errors because the information is not passed or is not available with consequences for patients (i.e. administration to the wrong treatment or incorrect treatment or oversights or omissions). In addition, Lewis in 2009[19] and Benoit in 2012[20] confirm that medication errors are very common in critical areas with very unstable patients where problems of leadership are fundamental.

Strategies of improvement

For organization problems:

- Implementation of the "Safety Walk-round (SWR)" in the critical area. A management group realizes these rounds, which are aimed to promote a conversation with the patients and are designed to identify existing or potential hazards that can lead to adverse events for patients[21]. All collected data from this round are then analyzed and allows the nurse to get answers on safety culture (process indicator), the number of errors reported monthly (outcome indicator) and the number of changes to the security introduced by the leadership. This methodology is effective for the identification of risks, adverse events, and the adoption of strategies for improvement at all levels[22].
- Identification of the correct nurse-patient ratio (to monitor work-loads) [23].
- Identification of a nurse referent for risk management within each critical care unit: this could represent an additional pivotal figure between hospital management framework and operational context.
- Implementation of specific methods to reduce medication error: 1) computerize prescribing treatment[24], 2) standardize the drug therapy (in unit/kg/dose) [25], 3) involve pharmacist in the clinical management staff[24-26]
- Utilization of bar codes for the infusion of red blood cells[21]. It enables verification at the bedside of the match between patient and blood sample identification codes.
- Standardization the “handover moment”[27] which represents a crucial role during patient’s transfer from critical areas.

For lacking of nurse s’ technical skills:

- Specific field training through methods of full involvement in the development of specific technical skills and for installation and / or use of special aids.
- Use of "check-lists"[28]

1. Use of standardized procedures in the operating room to reduce surgical error[29]

For lacking of nurse s’ “non-technical skills”:

- Foster a climate non-punitive incident reporting (“learn from the mistake”) [30-31]
- Training the leadership and team working aiming at improving the communication between professionals[32-33].
- Encourage and promote "audit / briefing / debriefing" moment between the health

professional as opportunities for discussion and sharing of issues[34].

Limitations

The study presents some limitations. First of all this is an observational study where only nurses working in critical care area compose the provider's population. It could have been of interest having collected opinions from other health-related professional figures (physicians and technical staff) in order to test different approaches to patient safety. Furthermore we ask the nurses to indicate the 5 five most frequent errors occurring during the last 6 months of their clinical practice and not the overall amount of errors. This cannot allow us to do a census of errors in critical care but give us a list of the most frequent errors in according to personal perception.

Conclusions

Safety culture refers to the summary of perceptions that employees share about the safety of their work environment. Employees' safety-related perceptions are based on several factors, including management decision making, organizational safety norms and expectations, and safety practices, policies, and procedures; all factors communicating an organization's commitment to safety.

The "settings" of critical area sustain life in complex and unstable patients but are associated with a significant risk of errors and adverse events. This study allows identifying the perception of nursing on clinical risk and on the report of errors in their units. Error reporting and the understanding of the potential risk factors, which is the starting point to spread awareness and safety culture among professional prove to be insufficient from our data. A planned strategy of improvement needs to be created to clarify problems, undertake improvement actions and strategies that will help the team to work in safety and quality of care.

Summary of the keypoints

1) Safety culture refers to the summary of perceptions that employees share about the safety of their work environment.
2) Employees' safety-related perceptions are based on several factors, including management decision making, organizational safety norms and expectations, and safety practices, policies, and procedures; all factors communicating an organization's commitment to safety.
3) The "settings" of critical area sustain life in complex and unstable patients but are associated with a significant risk of errors and adverse events.
4) The most frequent reported categories of errors are: drug related errors, errors in the management of medical equipment and procedural errors.
5) The most frequent perceived causes who were considered to have a great" impact on adverse events or near misses were: comunication problems, lack of structures, problems of "leadership" and inadequate sizing of nurse staff.
6) Error reporting and the understanding of the potential risk factors, which is the starting point to spread awareness and safety culture among professional prove to be insufficient from our data.
7) A planned strategy of improvement needs to be created to clarify problems, undertake improvement actions and strategies that will help the team to work in safety and quality of care.

Conflict: There was no conflict to declare

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