Clinical risk and patient safety: a multicenter cross-sectional study to explore knowledge, attitudes and practice of hospital nurses

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ABSTRACT

Objectives: To investigate knowledge, attitudes, and behavior of nurses working in acute care hospitals regarding clinical risk and patient safety, and to identify predisposing factors.

Design: Cross-sectional multicenter study.

Methods: The study was conducted in thirteen non-teaching acute public and private hospitals of a region of southern Italy from September through December 2015. A structured self-report questionnaire was administered to clinical nurses working in the hospitals involved. Three multivariate linear and logistic regression models have been constructed: knowledge of the definition of an adverse event; attitude towards risk of making an error while working; and nurses who reported at least one error in the past 12 months.

Results: The sample consisted of 484 respondents out of 670 (72.2%) nurses approached. The final multivariable model showed that educational courses about patient safety play a significant role in nurses gaining knowledge of adverse events. In the absence of organization-wide patient safety programs, nurses with low knowledge levels showed a significantly higher perceived risk. Nurses (n=96) who made errors over the past 12 months had discussed them with head nurses (75%) and colleagues (41.7%). Anonymous reporting to the organization was very low, with only 8.3% of nurses who had made an error submitting an anonymous report.

Conclusions: Managers should implement multimodal improvement strategies aimed at enabling nurses' to recognize the critical issues of the system and to increase their reporting, in order to make the organizations safer.

Key words: Patient safety, Knowledge, Attitudes, Practice, Nurses, Errors

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INTRODUCTION

Over the past two decades, quality and patient safety in healthcare have received growing attention from public and policymakers throughout the world, and have become a priority for healthcare organizations (1-3). Medical errors lead to increases in hospital length of stay, litigation costs, and hospital acquired infections (HAIs), lost income, disability and other additional healthcare expenses (4). Quality improvement requires a culture that encourages and enables healthcare professionals to deliver safe care. Healthcare professionals, and nurses in particular, play a major role in ensuring quality improvement and risk management by keeping patients safe and preventing errors. Indeed, nurses have several safety functions in the assessment of patients' condition and in dispensing or administering drugs (5). Many studies have investigated several aspects of patient safety in different healthcare settings (6-8), as well as knowledge, attitudes, and behaviors of healthcare workers (9, 10). However, to the best of our knowledge, little attention has been given to Italian nurses' knowledge, attitudes, and behaviors toward clinical risk and patient safety (11, 12). In that context, understanding this topic is crucial in order to develop effective interventions targeted at nurses. For this reason, to appropriately investigate and evaluate nurses' views on this topic, a cross-sectional study was performed of nurses working in acute care hospitals in Italy. The survey aimed at describing nurses' self-perceived knowledge, attitudes, and practices regarding clinical risk and patient safety and potential predictors of outcomes.

METHODS

Setting and sample

This study was carried out from September through December 2015 in a random sample of thirteen non-teaching public and private hospitals, with a number of beds ranging from 115 to 1094, located in the Campania region, Italy. All 670 nurses working in medical (general medicine, cardiology, geriatrics, nephrology, pulmonary) and surgical (ENT [ear, nose, throat], general surgery, oncology surgery, orthopedics/traumatology, neurosurgery) wards of each hospital involved were included in the study.

The sample size was determined on the basis of the proportion of nurses who would have an adequate level of knowledge. In the absence of prior data, a response distribution of 50% on this issue was assumed in the calculation of sample size, with 5% margin of error, and a confidence interval of 95%. Taking into account an expected response rate of 70%, a total of 398 nurses were needed.

Study procedure

A letter with information about the purposes of the study, the voluntary and anonymous participation, and the name and contact details of the study coordinator was sent to all medical directors of the selected hospitals. After formal written authorizations to conduct the study were granted by the selected hospitals, the questionnaire together with an informational leaflet was delivered to every potential participant. The leaflet explained the aims and the procedure of the study, that confidentiality would be protected since no names or other personally identifying information was recorded, and that results would be used only for research purposes. Written informed consent was obtained from participants before the return of the questionnaire. No compensation was given to the respondents for their participation in the study.

Survey instrument

The survey instrument was developed through extensive literature search and from previously published studies (1, 2, 4, 11, 13-25). The self-administered questionnaire consisted of five sections. First, socio-demographic characteristics such as gender, age, level of education, professional role, ward, and job experience. Second, knowledge about clinical risk, near misses, and adverse events. Third, attitudes towards errors in healthcare organizations, their management and responses, perceived risk of making a mistake during work, perceived risk for patients of suffering an adverse event, and attitudes about the severity of some types of adverse events. Fourth, frequency, types, and causes of adverse events and/or near misses during the previous year and behaviors and communication after error(s) and/or near miss(es). Fifth, sources of information on clinical risk and patient safety and interest in acquiring additional information.

To assess knowledge, four questions were asked using a 3-point Likert-type scale with options for "agree," "uncertain," and "disagree". To assess the attitudes, thirteen questions were asked, six of them with responses on a 3-point Likert-type scale with options for "agree," "uncertain," and "disagree" and seven using a 10-point Likert-type scale, ranging from 1 (unfavorable attitude) to 10 (favorable attitude).

Multiple-choice questions were asked to indicate the type of error made from a list (from the Sentinel Event Statistics by the Joint Commission Accreditation of Healthcare JCHCA, March 2010).

Additional multiple-choice questions explored the behavior of nurses regarding the mistakes made, communication, feedback and causes, according to the JCAHO patient safety event taxonomy (26) that in their opinion favored the occurrence of errors.

Pilot Study

A panel of two experts on clinical risk and patient safety assessed the questionnaire for appropriateness, accuracy, and relevance and were asked to criticize the questionnaire's content. In addition, the questionnaire was tested on a sample of 20 nurses to ensure the questions were clear and understandable. Based on the participants' review, modifications were made to the structure of questions.

Ethical approval

As this project was planned as part of risk management activities at the selected hospitals, it was not necessary to obtain an institutional review board approval.

Data analysis

Descriptive statistics have been used to characterize the sample. To assess the association between continuous and categorical variables, t-test or chi-square tests have been used. Variables that were significant at $p \leq 0.25$ in univariate analysis were included in a final multivariable linear and logistic regression models(27). Three multivariate linear and logistic regression models have been constructed: knowledge about the definition of an adverse event (Model 1); attitude towards risk of making an error while working (Model 2); and nurses who reported medical errors in the past 12 months (Model 3). For purposes of analysis, the outcome variables, originally consisting of multiple categories, were collapsed into two levels. In Model 1, nurses were divided in those knew the definition of the preventable adverse event versus all others; in Model 2 nurses were divided in those who have more attitude towards risk of making an error versus all others, and in Model 3 nurses who reported more than one error in practice during the last year (from 1 to 3) versus all others (Model 3). The following predictor variables were initially tested in all models: gender (male=0, female=1), age (continuous, in years), educational level (three years registered nurse diploma=1, baccalaureate degree=2), ward (medicine=0, surgery=1), professional role (registered nurse=0, head nurse=1), number of years in practice (<10=1, 11-20=2, 21-30=3, >30=4), educational courses and scientific journals as sources of information about patient safety and medical error and need for additional information (no=0, yes=1). In Model 3, the following variables were also included: knowledge about the definition of an adverse event (no=0, yes=1) and perceived risk on patient safety (continuous). In Model 2, the variables 'attitude toward interest in patient safety only after an adverse event happens' (continuous) and 'attitude

toward actions in support of patient safety' (continuous) were included. A stepwise selection procedure with a forward method was used, and a significance level of 0.2 was used as the criterion for variables to enter in the regression models and 0.4 for variables to remain. Results of the logistic regression models are presented as odds ratios (ORs) with 95% confidence intervals (CIs). Results of the linear regression model are presented as standardized regression coefficients (β). All statistical tests were two-sided with p-values lower than or equal to 0.05 considered as being statistically significant. Statistical analyses were performed on software Stata 10.1.

RESULTS

Demographic and professional characteristics

Of the 670 surveys administered, a total of 484 nurses returned the questionnaire (response rate = 72.2%). The socio-demographic and professional characteristics of the sample are shown in Table 1. Just over half of nurse respondents were female (50.9%) with a mean age of 44 years, and an average of 18 years in practice. The mean of work experience in their current ward was 10 years and more than half worked in surgical wards (58.8%). Most of the responding nurses (77.2%) hold a 3-year diploma, whereas 22.8% hold a bachelor degree.

Nurses' knowledge about clinical risk definitions

The majority of nurses (65%) showed knowledge that adverse events were defined as an injury caused by medical management rather than disease processes, and that resulted in either prolonged hospitalization or disability at discharge.

Almost half of the respondents (48%) knew that a preventable adverse event is an avoidable adverse event based on currently available knowledge and accepted practices, while 40.5% knew the definition of a near miss.

Overall, less than half knew the definition of clinical risk (38%).

Table 2 shows the results of the multivariate analysis regarding the association between the different outcomes of interest and the various explanatory variables. Female nurses (OR = 1.0; 95% CI 1.03-2.23) and nurses who have received information about medical error and patient safety from educational courses (OR = 1.86; 95% CI 1.25-2.80), were more likely to know the definition of an adverse event (Model 1 in Table 2).

Attitude towards clinical risk and patient safety

With regard to the perceived risk for patients of

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TABLE 1. Demographic and practice characteristics of the study population

	N	%
Gender (481)		
Female	245	50.9
Male	236	49.1
Age group, (years) (484)		43.6±7.8(20-64)*
< 35	60	12.4
36-40	124	25.6
41-45	126	26
46-50	72	14.9
>50	102	21.1
Educational level (483)		
Diploma (3Y)	373	77.2
Baccalaureate/ Graduate degree	110	22.8
Years in practice (484)		18.3±7.9(1-39)*
<10	101	20.9
11-20	235	49
21-30	95	19.3
>30	53	10.8
Experience in current unit (years) (482)		10.2±7.1(1-36)*
<5	125	25.9
6-10	192	39.9
11-15	66	13.7
>15	99	20.5
Professional role (484)		10.2±7.1(1-36)*
Ordinary Nurse	435	88.9
Head Nurse	49	10.1
Ward of employment (483)		
Surgery	284	58.8
Medicine	199	41.2
Standard Deviation (range) In parentheses number of respondents		

suffering an adverse event injury during healthcare, respondents overall had a mean score of 4.7 (range 1-10).

Mean total score of attitudes towards patients' adverse outcomes, considered by the nurses according to their severity, was of 6±4 for "HAIs" (Hospital Acquired Infections) and "medication error", while "procedure on / treatment of wrong patient" and "accidental falls" were respectively of 6±3.7 and 5.9±3.1, measured on a 10-point Likert scale ranging from 1 to 10, with higher scores indicating very severe outcome.

A stepwise multiple linear regression was conducted to assess which variables predicted the "risk perception of making an error during the work activity". The perceived risk was significantly higher in those who do not know the definition of an adverse event, in those who work in the facilities where actions to promote patient safety are not carried out, and in those who believe that there is interest in patient safety only after an adverse event happens (Model 2 in Table 2).

Practices about reporting and disclosure of error

Most of the respondents (n= 190; 40.1%) reported no safety-related events over the past 12 months. Of those who reported events, 96 nurses (62.7%) reported one event, 42 (27.5%) two events and 15 (9.8%)

TABLE 2.

VARIABLE	OR	95% CI	p
MODEL 1. KNOWLEDGE ABOUT ADVERSE EVENT'S DEFINITION (N=479)			
Gender			
Female*	1.0*		
Male	1.51	1.03-2.23	0.036
Younger Age	0.98	0.96-1.00	0.126
Educational courses	1.86	1.25-2.80	0.002
Variable	Coeff	t	p
MODEL 2. MODEL 2. PERCEIVED RISK OF MAKING AN ERROR DURING THE WORK ACTIVITY (N=477)			
Younger Age	-0.16	-1.13	0.26
Need of additional information about medical error and patient safety	0.36	1.08	0.28
Working unit			
Medical*			
Surgical	-0.24	-1.08	0.28
Know the adverse event's definition	-0.47	-2.06	0.040
Ward's actions in support of patient safety	-0.97	-4.23	0.000
We seem interested in patient safety only after an adverse event happens	0.67	2.87	0.004
Constant	5.83	7.80	0.000
Variable	OR	95% CI	p
MODEL 3. NURSES WHO REPORTED MEDICAL ERROR IN THE PAST 12 MONTHS (N=279)			
Age	1.03	0.98-1.09	0.213
Know the adverse event's definition	0.63	0.37-1.04	0.072
Years in practice	0.97	0.92-1.01	0.189
Perceived risk on patient safety	1.17	1.05-1.30	0.004
Need of additional information about medical error and patient safety	2.04	1.03-4.04	0.040
*Reference category			

reported three events.

Respondents usually attributed medical errors to more than one cause (Table 3). Among system failures, "overwork, stress or fatigue of health professionals" was the most rated item, while "poor attention" and "low adherence to guidelines/protocols/procedure" were the most rated items among causes of error related to the human factor (Table 3).

The results of the multivariate logistic regression model along with the ORs and 95% CIs indicated that nurses who "perceive risk on patient safety" (OR = 1.17; 95% CI 1.05-1.30) and "who need additional information about medical error and patient safety" (OR = 2.04; 95% CI 1.03-4.04), have reported medical error/s in the past 12 months (Model 3 in Table 2).

When asked about their main source of information about clinical risk and patient safety, a substantial proportion of the participants indicated that they have received information (92.7%).

Most respondents reported that educational courses were the major sources of their information (68.7%), followed by Internet sources (40%) and scientific journals (30.7%). The vast majority (87.3%) of participants would like to improve their level of knowledge.

DISCUSSION

To our knowledge, this study is one of the few published investigations that have rigorously addressed nurses' knowledge, attitudes, and practices towards patient safety and medical error in Italy. In the health-care setting, it is important to consider what healthcare professionals know about clinical risk and patient safety. To ascertain the knowledge of clinical risk, we have based our enquiry on previously recognized and internationally validated definitions of *clinical risk* (IOM, 2000; Italian Ministry for Health, 2004),

TABLE 3. Causes reported and behavior to the occurrence of errors by nurses

CAUSE REPORTED OF ERRORS[a] (N=153)	%[b]
Systems structure/process	
Overwork, stress, or fatigue of health professionals	86.7
Poor teamwork design within the workplace	66.7
Failure of health professionals to communicate as a team	33.3
Poor supervision of inexperienced health professionals	7.1
Human	
Low adherence to guidelines/protocols/procedure	40
Poor attention	20
Failure due to incorrect or incomplete knowledge	20
Low perception of risk	8.9
Health professionals poorly skilled or experienced	6.7
Other	1.8
BEHAVIOR TO THE OCCURRENCE OF ERRORS BY NURSES (N=153)	
Reported error to Head Nurse	75
Discussed about medical error with colleagues	41.7
Anonymous reporting event	8.3
Discussed about medical error with patient	3.7
Discussed about medical error with friend/relative	2
Other	9.3

[a] According to JCAHO patient safety event taxonomy
[b] Multiple answers were possible.

adverse event, preventable adverse event and near miss (AHRQ, 2016). Nevertheless, our questionnaire addressed evidence that was current at the time of the survey and would have reflected the potential evidence base of nurses. This study demonstrated that nurses have an inadequate level of knowledge concerning the main definitions such as that for adverse event (65%) and the difference between a preventable and a non-preventable adverse event (48%). Levels of knowledge were lower, particularly regarding knowledge of the definition of clinical risk (38%). However, although almost all respondents reported they had received information on clinical risk (92.7%), the same participants would like to improve their level of knowledge (87.3%). In the final multivariable model, the results lead to the conclusion that educational courses about medical error and patient safety (OR = 1.86; 95% CI 1.25-2.80) as the source of information play a significant role in nurses gaining knowledge about the definition of an adverse event. Lower levels of knowledge about specific issues of patient safety are reported in other studies (11, 22, 28, 29) and literature regarding nursing and patient

safety concluded that gaps in nursing patient safety knowledge exist (30). These findings suggest the need for including the current scientific evidence on patient safety in educational curricula and programs for nurses and other HCWs to help them improve their knowledge of the culture surrounding patient safety using a multi-modal improvement strategy. Moreover, these findings suggest that further research should be conducted into Italian nurses' knowledge of clinical risk and patient safety.

Understanding nurses' perception of patient safety and avoidable adverse events is vital for policy makers to address the patient safety culture from the stand-point of nurse staffing policies. The survey instrument contained attitude statements about the perceptions of patients' adverse outcomes considered more important by the nurses because of their severity ("HAIs" due to wrong nursing procedure/treatment, medication error, procedure on /treatment of wrong patient, patient falls and delay in execution of a procedure/treatment). With regard to the aspects of "HAIs" severity, respondents overall identified that their main concern was about the

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severity of acquiring an infection due to wrong nursing procedure/treatment and it was indicated on a scale with a range from 1 to 10, with a mean score of 6.4. In a previous study, a moderately positive attitude towards the risk of transmitting infection due to wrong nursing procedure/treatment, has been found in nurses working in different settings in the Italian hospitals (16, 31). Findings from this survey showed a very low positive attitude about the nurses' perception of risk that patient may suffer an adverse event by care practice, on scale with a range from 1 to 10, with a mean score of 4.7 (63.6%).

Based on multivariate regression analysis a stepwise multiple linear regression was conducted to assess which variables predicted the nurses' "risk of making an error during the work activity". The perceived risk was significantly higher in those who do not know the definition of an adverse event, in those who work in the facilities where actions to promote patient safety are not carried out, and in those who believe that there is an interest in patient safety only after an adverse event happens (Model 2 in Table 2). The results of the multiple logistic regression analysis highlight the important effect that several factors may have on the perception of the risk of an error occurring. This finding showed more risk perception probably correlated to the absence or lesser prevalence of safety measures, where an organization-wide patient safety program is not present or is not implemented. The results of the multivariate analysis showed a significant association between nurses who reported medical error/s in the past 12 months with a high perceived risk of patient safety and need for additional information. This result shows the need for targeted interventions by managers of organizations in order to increase the perception and ability of nurses to recognize the critical issues of the system and to promote, consequently, an increase in the number of appropriate reports to make the organizations more safety-conscious.

The majority of nurses who reported errors while working in the last year, stated that they had discussed these with a head nurse (75%) and colleagues (41.7%) after an error had occurred, and we did not find any discrepancy between the hypothetical situation and the corresponding behavior in attitudes shown. This is an interesting result, because it highlights the behavior of Italian nurses at least at the informal disclosure of errors. Nevertheless, the findings from this survey showed that anonymous reporting was very low, with only 8.3% of nurses submitting anonymous reports. It is widely known that error reporting can be a difficult subject for nurses and other healthcare professionals: while nearly all realize the beneficial consequences of such reporting, a pervasive reluctance may persist to engage in such a practice. Several studies confirmed a trend of under-reporting of errors by nurses (19, 21, 32-34); the main

reasons given included fear of consequences, blame, saving professional reputation, preventing stigma, legal problems and organizational misconduct, nurses being uncomfortable with reporting errors, and peer reactions (10, 28, 35-38). Such circumstances demand better error reporting strategies (34).

The findings showed that most nurses attributed the causes of medical errors to overwork, stress or fatigue (86.7%), while fewer attributed them to low adherence to guidelines/protocols/procedure (53%), lack of knowledge (20%) and poor attention (20%) as the major factors leading to adverse events.

Limitations

To appreciate the findings of this current survey, some potential limitations in the design and measurements need to be addressed. First, because this is a cross-sectional study, any causal relationship between the variables examined and the outcomes of interest was difficult to determine. Second, similar to all data based on self-report questionnaires, the accuracy of the results largely depended on the honesty and understanding of the respondents, potentially limited by recall bias. Third, as a general limit to the questionnaire, nurses may tend to provide socially more desirable answers that may show appropriate practice but may not reflect reality (16). We are confident that responses were self-reported in an anonymous and confidential setting but, given the nature of the topic surveyed, we may not exclude over-inflated responses. If true, we might consider an even worse scenario than that depicted by nurses. To overcome the prejudices of social desirability and improve the validity of the data, an anonymous self-administered questionnaire was used that can minimize the inclination to provide social desirable responses and to increase the willingness of respondents to participate. Fourth, the questionnaire was submitted only to nurses, and the results may not be generalizable to other HCW populations, although this was not a purpose of the survey. Despite these limitations, the large sample size and the high response rate in the study reduce the probability of bias in the sample and this study provides primary yet valuable data.

CONCLUSIONS

Patient safety has been recognized worldwide as a global public health problem due to the intimidating prevalence of healthcare errors and the consequent harm to patients (39). The results of this study underline the importance of educational interventions, and their implementation is needed to address the gaps regarding knowledge and patient safety issues, and to ensure that nurses apply this knowledge. Organizational and

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managerial strategies to nurture a culture of patient safety in southern Italian hospitals should focus upon building leadership capacity to create a supportive environment of open and blame-free communication, lean work processes and continuous organizational learning.

Relevance to clinical practice

The results from this study highlight the need to facilitate the translation of positive attitudes into actual appropriate practices that have proven to be effective in reducing medical errors. Such results support building two important issues of patient safety: the culture of "reporting" to encourage the reporting of adverse events in order to improve risks identification in the healthcare facilities and support a better analysis of these, and support for the vital role of nurses in decreasing the rate of harmful patient events.

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Competing interests

The authors declare that they have no competing interests.

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