Designing a Nursing Risk Management System

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ABSTRACT

Context: Risk management identifies, assesses, and controls threats to an organization's goals. These risks stem from various sources, including financial uncertainties, legal liabilities, technology issues, strategic management errors, healthcare incidents, and natural disasters.
Aim: The present study aimed to design a nursing risk management system and assess the effect of the designed nursing management system on the nurses' knowledge and performance regarding risk management.
Methods: This study used a quasi-experimental (pre/post-test) design on 61 nurses working in critical care units and a 30-member jury group composed of four hospital nursing managers and 11 academic staff from the faculties of nursing and 15 physicians from the hospital and academic staff from the faculties of medicine. The study was conducted at critical care units in El-Demerdash Hospital. Two tools were used to collect data for this study: A knowledge assessment questionnaire, a nurses' performance observation checklist, and a jury opinionnaire sheet.
Results: The study reveals that 47.5% of the studied nurses were between 25-35 years of age, 63.9% were females, 63.9 had secondary school diplomas, and 44.3% had between 10 to 20 years of experience in nursing. There was a highly statistically significant improvement in nurses' knowledge of the risk overview dimensions, nurses' knowledge related to nursing practice dimensions, and hospital infection and patient safety dimension and total mean knowledge score at p=0.00. A highly statistically significant difference was revealed between pre and post-test regarding the nurses' performance regarding nursing risk management at p <0.05.
Conclusion: Nurses' knowledge and performance in risk management are enhanced after designing and implementing a nursing risk management system. The study recommends conducting continuous training programs on all aspects of nursing risk management and establishing an orientation program for all new nurses about risk management.

Keywords: Nursing risk management system

1. Introduction

Risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. It may also apply to situations with property or equipment loss or harmful environmental effects. Healthcare organizations share broad risk categories, i.e., clinical, regulatory, environmental, and privacy, with specific risks that vary by type of organization *(Tucci & Stedman, 2024)*.

Risk assessment is a term used to describe the overall process or method of Identifying hazards and risk factors that can potentially cause harm (hazard identification) and analyzing and evaluating the risk associated with that hazard (risk analysis and evaluation) *(Shortreed et al., 2003)*.

Moskowitz et al. (2022) clarified that risk management includes any activity, process, or policy to reduce liability exposure. From both a patient safety and a financial perspective, it is vital that health centers conduct risk management activities to prevent harm to patients and reduce medical malpractice claims.

Risk management identifies, measures, and treats property, liability, income, and personnel exposure to loss.

Risk management's ultimate goal is to preserve the organization's physical and human assets to successfully continue its operations *(Fraser, & Simkins, 2011)*. The purpose of risk management is not to eliminate all risks. It is to minimize the potential negative consequence of risks. By working with risk managers, employees can make smart risk decisions to improve the chance of reward. Risk management in health care can mean the difference between life and death, which makes the stakes significantly higher *(Esa et al., 2018)*.

Risk management, identification, analysis, control, financing, and claims management principles can be applied to almost any situation or threat. These threats or risks could stem from a wide variety of sources, including financial uncertainty, legal liabilities, strategic management errors, accidents, and natural *disasters (Iadanza, 2019)*.

Healthcare risk management comprises the systems and processes employed to uncover, mitigate, and prevent risks in healthcare institutions, understand its purpose, elements, the risk manager's role, and more *(Thomas, 2020)*.

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Risk management allows organizations to prepare for the unexpected by minimizing risks. Risk management is intentionally proactive, not reactive. Patient safety is the absence of preventable harm to a patient during health care and the reduced risk of unnecessary harm associated with health care to an acceptable minimum. An acceptable minimum refers to the collective notions of given current knowledge, resources available, and the context in which care delivered weighed against the risk of non-treatment or other treatment *(Slawomirski et al., 2017).*

Management of risks identifies and evaluates risks, identifies and analyzes various risks associated with business, reduces and eliminates harmful threats, supports the efficient use of resources, better communication of risk within the organization, reassures stakeholders, and supports the continuity of the organization *(Popov et al., 2016).*

Risk managers specialize in identifying potential causes of accidents or loss, recommending and implementing preventive measures, and devising plans to minimize costs and damage should a loss occur, including the purchase of insurance. In other words, they coordinate loss control systems for organizations and businesses, which may include disaster recovery plans and emergency evacuations *(Van Der Voort et al., 2019).*

2. Significance of the study

Errors and patient mismanagement are directly related to defects and insufficiencies in the healthcare system, and in many cases, they originate from similar defects in the system. A system approach to medical error and its reduction is crucial. To meet such an important objective, the establishment of a risk management system is necessary *(Smits et al., 2010).*

A risk management system is developed to mitigate the effects of errors, protect patients from risk, and help hospitals achieve high-quality care by helping nurses identify potential risks, develop procedures to address them ,and make them qualified to carry this out.

3. Aim of the study

This study was aimed at designing a nursing risk management system through
- Conduct baseline assessment of nurses' performance (knowledge and practice) for risk management.
- Designing a nursing risk management system.
- Validating the developed system.
- Assess the effect of the designed nursing management system on nurses' performance in risk management.

3.1. Research hypothesis

Nurses' performance (knowledge and practice) in risk management will be enhanced after a nursing risk management system is implemented compared to the pre-implementation level.

4. Subjects & Methods

4.1. Research Design

This study used a quasi-experimental design to evaluate the effect of the designed nursing risk management system on the nurses' knowledge and performance in the critical care units. The independent variable is the designed risk management system and the dependent variables are the nurses' performances (knowledge and practices).

4.2. Study setting

The study was conducted at El-Demerdash University Hospital, which is affiliated to Ain Shams University hospitals with a capacity of (100) beds distributed by seven critical units, including emergency reception, emergency neurology, emergency orthopedic, ICU, operation theater (emergency neurosurgery), emergency 4th surgery and emergency 5th surgery.

4.3. Subjects

Subjects included in the study:
Nurses group: The total number of nurses working in the critical care unit settings during the study was 61 out of 65; four were on maternity leave.
Jury group: The 30-member jury group comprised 15 nursing leaders and 15 physicians from Ain Shams, Cairo, and Helwan universities. The nursing leaders included four nurse managers from the hospital (with a bachelor's and a doctorate degree in nursing) and 11 academic staff from the nursing faculties (with a nursing doctorate). The physician group included 12 from the hospital (with a bachelor's degree and a master's degree in medicine) and 3 academic staff from faculties of medicine specialized in Hospital Accreditation, Quality, and Infection Control (all with doctorate degrees)

4.4. Tools of data collection

Two tools were used to collect data for this study.

4.4.1. Knowledge Assessment Questionnaire

The researcher developed the knowledge assessment questionnaire through a review of related literature *Sullivan and Decker, (1987); Mostafa (2009); Abd El-Kader (2013); Perry et al. (2013); Saad (2014); Saker et al. (2019); and Selim (2019).* It was developed to assess the knowledge of the nurses' group regarding risk management systems.

It consists of two parts: Part one was intended to collect data regarding personal and job characteristics of study subjects regarding age, gender, qualifications in nursing, years of experience, and previous training program. Part two was intended to collect data about nurses' risk management knowledge. This knowledge questionnaire comprised 40 multiple-choice questions (MCQs) and 10 true and false. The questionnaire was developed in Arabic language. The questions are grouped into three main dimensions as follows: Risk overviews (10 questions) such as definition of risks, risk management steps, and risk manager duties and responsibilities; risks in nursing practice (24 questions) that include such questions as nursing documentation, patient falling, and bedsore; hospital infection and patient safety (16 questions) that include such questions as most common type of hospital infection, dual patient identification during blood transfusion, and receiving of verbal orders.
Scoring system
Knowledge scores ranged from "1" for the correct answer to "zero" for the incorrect answer. The maximum possible total score was (50 grades). Each dimension is

presented as frequency and percentage for the three dimensions. The knowledge was considered satisfactory if the percent score was ≥60% and unsatisfactory if <60%.

4.4.2. Nurses' Performance Observation Checklist

The researcher developed the observation checklist through a review of related literature *Rowland and Rowland (2020), Mostafa (2009); Abd El-Kader (2013); Perry et al. (2013); Saker et al. (2019); Selim (2019)*. it was used to assess nurses' performance **in** nursing risk management activities. This observation checklist contained ten main dimensions involving (59) sub-dimensions. The ten dimensions included risks of patient movement inside the hospital dimension (6 activities), risks related to the hospital intervention procedure (5 activities), nursing care provided (5 activities), daily check of medical equipment (4 activities), non-compliance with patient safety standards (7 activities), non-commit to incident report notification (6 activities), non-compliance with infection control instruction (7 activities), hospital department services (6 activities), hospital infrastructure (7 activities), and risks related to non-compliance with hospital plans (6 activities).

Scoring system

Performance scores were from "1" to "zero" for done/not done, respectively. The maximum total score was (59 grades). Each dimension is presented as frequency and percentage for the dimensions. The performance was considered satisfactory if the percent score was ≥60% and unsatisfactory if <60%.

4.5. Procedures

Ethical considerations: The Scientific Research and Ethics Committee approved the study protocol at the Faculty of Nursing, Ain-shams University. After explaining the study aims and procedures to each nurse, verbal informed consent was obtained from them before collecting any data. Participants were informed about their right to refuse participation or to withdraw from the study at any time without giving any reason. Data were collected and used only for research purposes. No harmful maneuvers were performed or used, and no foreseen hazards were anticipated from conducting the study on participants.

An official letter from the Faculty of Nursing, Ain-Shams University, was issued to obtain permission from the Director of El-Demerdash Hospital to conduct the study. Then, the researcher met with the medical and nursing directors to explain the study's aim and procedures and gain their cooperation.

Preparatory phase: This stage started in April 2018 and ended in April 2019. The researcher reviewed national, international, current, and past related literature and used textbooks, articles, journals, and theses concerning the study topic. Based on this review, the researcher began to develop the study tools**.**

The reliability test was done to ensure consistency and determine how strongly the attributes were related to each other and the composite score. The reliability of the tools was also tested using Crombach's alpha coefficient. For the questionnaire, it was 0.86 for the knowledge section and 0.86 for the nurses' performance checklist.

Pilot study: Upon developing the data collection tools, a pilot study was started in May 2019 to examine the applicability and clarity of language, test the feasibility of the research process and suitability of the designated questionnaires, and estimate the time needed to fill in the study tools. Six nurses enrolled in different hospital units represent 10% of the study subjects. They were included in the main study sample. Data obtained from the pilot study was analyzed. Accordingly, minor changes were made for a few unclear words. The time consumed to fill in the observation checklist by the researcher was about 3-5 days for every nurse during the patient's care.

The questionnaires were mitigated because they contained many details. Based on recommendations, necessary modifications were made, and questionnaires were rearranged.

The actual field work started at the beginning of July 2019 and was completed by the end of October 2020. The current study was carried out in five phases: Assessment, system planning, system validation, system orientation, and post-system orientation.

Phase I (Assessment): The researcher collected data by meeting the studied nurses and explaining the purpose of the study to them in the study setting. Knowledge assessment questionnaires were distributed and completed by nurses. The researcher was always present while fulfilling the forms to answer questions from 12 pm to 1 pm during morning and afternoon shifts from 7 pm to 8 pm. The second stage began by assessing the nurses' baseline information and the nurse's practice regarding the risk management system.

Phase II (System planning): The planning phase of the risk management system was based on a related literature review, in addition to the assessment phase of nurses' knowledge and performance. The planning for the system included risk management department formation, determining risk manager responsibilities, establishing a risk management committee, deciding criteria of incident reports, preventing medication errors, bed sores, complications related to patient restriction, and blood transfusion. Additionally, checks of the crash cart, medication room, environmental safety, avoidance of the risk of infection, isolation precautions, documentation skills, vital alarm devices, and emergency codes.

Phase III (System validation): The system was designed and validated by (30) jury group members experienced in the study's field. The system's validity was verified by offering it to experts specialized in these fields to express their opinions on whether it could be achieved or not, taking into account some of the modifications that were added to the tasks. Based on this, the orientation of the risk system for nursing was made.

Experts amended hospital accreditation by adding the safety plans because they are directly related to the patient's safety inside the hospital, such as how to deal with the fire and the evacuation plan for patients, especially those who cannot move. By the quality experts, the incident report was added because it is a mirror of harmful events that the patient may be exposed to during hospitalization, such as patient falls, bed sores, medication errors, patient misidentification,

unsafe surgery, healthcare-related infection, tube wrong connection, burning from operations.

The hospital infection control officer focused on infection control instructions to reduce the rate of hospital infection and thus the number of days the patient stays in the hospital, such as hand hygiene, wearing personal protective equipment during the patients' procedures, isolation precautions, waste management, and following up the cleanliness of patient rooms after discharge.

Phase IV (System orientation): Modifications were made to the system, and a suitable time was selected for orienting nurses of the nursing risk management system based on consultation with the nursing director. The researcher designed the nursing risk management system to be appropriate for achieving the objectives and contents of the system. During this phase, the researcher met the nurses again according to availability and workload for nurses' orientation of the proposed system. This stage was implemented over three months, from April 1 to June 15, 2020.

In the beginning, the researcher explained the concept of risk and how to assess and manage it to protect the patient from harm and protect the hospital from litigation. The researcher stressed the importance of documentation in nursing forms; documentation is done on nursing forms immediately after care is provided and not scraping and writing off forms to avoid documentation errors.

Stress on verbal orders was activated, an incident report was activated, and a safe surgery checklist was activated within the operating rooms. To avoid patient falls, the researcher stressed that the letter (F) was activated on the beds/doors/bracelets of patients exposed to falls. Patient assessment against bed sores and effectiveness of the air mattress and constantly making sure that it is connected to the electricity source, especially intensive care patients, and making sure the patient-related connections are secured to prevent misconnection were also activated.

The nurses were introduced to high-risk medications and drugs that are look-alike and sound alike, and the importance of addressing them and separating them with shelves was emphasized. Antibiotic allergy tests before giving it were highlighted. The medication preparation room closure after use and checking the temperature and humidity were stressed. The temperature of the medicine fridge was checked every shift. Assisting nurses in the environmental assessment to provide a safe environment for the patient, such as ensuring that there are no electrical wires on the ground or water to prevent the patient from falling.

Follow up on the technician responsible for checking the air conditioners regularly. The researcher performs daily follow-ups of the nurses' performance and corrects errors through the daily rounds.

The administrative process followed in implementing the risk management system was done according to the following stages:
- Planning stage: Risk assessment, creating a risk management action plan.
- Organizing phase: The researcher developed a risk management program and formed relevant committees at this stage.

- Directing phase: This stage has been applied by motivating and encouraging the nurse and building a non-blame culture.
- Controlling phase: The final stage of system design involves controlling by applying strategies to manage risks, continuous monitoring, and review.

Phase V (Post-system orientation): After the system orientation stage was completed, its effectiveness was assessed through the post-system orientation stage for nurses' knowledge and practice of risk management. This assessment was done after three months of system orientation using the same corresponding questionnaires in the pre-system orientation stage.

4.6. Limitation of the Study

Due to the COVID-19 pandemic, some limitations occurred, including changes in the hospital layout and the reengineering of some units. Also, some administrative approvals could not be obtained to complete the proposed nursing risk management system.

4.7. Data analysis

Data entry was done using the SPSS v. 25 computer software package. Quality control was done at the stages of the coding and data entry. Frequency distribution was conducted as descriptive statistics for all study variables. The chi-square test was used to assess the difference in the frequency distribution of all study variables between the pretest and post-test; the paired t-test was used to assess the difference in mean of total knowledge and total practice between the pretest and post-test. Pearson's correlation was used to assess the relationship between the study variables. The P-value is significant at ≤0.05 and highly significant at ≤0.001.

5. Results

Table 1 shows that 47.5% of the studied nurses aged 25-35, 63.9% were females, and 63.9% had nursing diplomas. Regarding years of experience, 44.3% had 10-20 years; 63.9% of the studied nurses had attended infection control training program.

Table 2 shows that 33.1% of the nurses had satisfactory knowledge regarding the definition of risks before implementation of the designed system, improved to 100% after system implementation with a highly statistically significant improvement in nurses' knowledge regarding all risk identification in post system orientation as compared to pre system orientation phase ($p<0.05$).

As regards the comparison of nurses' knowledge regarding risks in nursing practice dimensions, Table 3 reveals that only 19.7% of the studied nurses had satisfactory knowledge regarding the proper documentation in nursing records before system implementation increased significantly to 95% after system implementation. Additionally, 8.2% had satisfactory knowledge regarding the definition of patient fall improved significantly to 98.3% after system application, with highly statistically significant improvements in all nursing practice dimensions regarding the possible risks.

Table 4 shows that none of the studied nurses exhibited satisfactory knowledge regarding types of hospital infection that improved significantly to 91.8% after system application. Additionally, only 11.5% of the nurses show a satisfactory knowledge level regarding receiving verbal orders that significantly improved after risk management system application, with statistically significant improvement in staff nurses' knowledge regarding all elements of hospital infection and patient safety procedures in post-system orientation compared to pre-system orientation.

Table 5 concludes that there is a significant statistical difference in total nurses' knowledge regarding risk management between pre- and post-system orientation.

Table 6 demonstrates high statistically significant improvements in nurses' performance of risk management activities' mean score after the system implementation compared to pre-system implementation (p<0.05).

Table 7 reveals a statistically significant weak positive correlation between total knowledge and total performance in pre-system implementation and a highly statistically significant strong positive correlation between total knowledge and total performance in post-system implementation.

Table 8 shows that the jury group consisted of 30 members, 40% of whom were lecturers. It included members from the Nursing Administration (40%) and medical-surgical departments (37%). 67% of the sample was from Ain Shams University. The majority were females (67%). 60% of them had more than 10 years of experience.

Table 8 points to jury group members' agreement upon almost all items of the proposed risk management system's face validity. The exception was related to the system being written correctly, scientifically, and appropriately, which was agreed upon by 90% of the jury members. The system also covers all relevant aspects (90%).

Regarding content validity, Table 9 demonstrates that jury group members agreed upon all planning and organizing elements except for the definition of the nursing procedures (93%). 97% of the jury members agreed on the directing and controlling components.

Table (1): Frequency and percentage distribution of demographic characteristics of the studied nurses (n=61).

Characteristics of the studied nurses	No.	%
Age		
Less than 25 years	4	6.6
25-35 years	29	47.5
More than 35 years	28	45.9
Gender		
Male	22	36.1
Female	39	63.9
Qualifications in nursing		
Nursing school Diploma	39	63.9
Nursing Technical Institute diploma	10	16.4
Bachelor's degree	12	19.7
Experience in nursing		
Less than ten years	10	16.4
10-20 years	27	44.3
More than 20 years	24	39.3
Previous attending of training program		
Risk management	8	13.1
Healthcare quality	13	21.3
Infection control	39	63.9
Patient safety	1	1.6

Table (2): Comparison of nurses' knowledge regarding risk overview dimensions pre and post-system application (n=61).

Risk Overview Dimension	Satisfactory knowledge				χ2 test	p-value
	Pre system application		Post system application			
	No	%	No	%		
Definition of risk	22	36.1	61	100.0	2.54	0.01
Risk management steps	14	23	58	95.0	1.65	0.02
Risk manager duties and responsibilities	1	1.6	53	86.9	2.76	0.04
Risk committee role	0	0	56	91.8	1.03	0.00
Risk assessment priorities	4	6.6	58	95.0	1.82	0.05

Table (3): Comparison of nurses' knowledge regarding risks in nursing practice dimensions pre and post-system application (n=61).

Risks in the nursing practice dimension	Satisfactory knowledge				χ2	p-value
	Pre system application		Post system application			
	No	%	No	%		
Nursing documentation						
Nursing documentation specifications	13	21.3	57	93.4	3.11	0.03
Proper documentation in the nursing record	12	19.7	58	95.0	0.54	0.02
Patient falling						
Definition of patient fall	5	8.2	60	98.3	3.47	0.00
Patient's fall report	14	23	59	96.7	3.65	0.04
Bedsore						
Definition of bed sore	12	19.7	57	93.4	4.25	0.04
Bedsore sites	21	34.4	58	95.0	5.43	0.03
Medication error						
Medication intake rights	17	27.9	60	98.4	2.34	0.03
Before giving medication	7	11.5	58	95.0	1.56	0.02
Symptoms of drug allergy	7	11.5	58	95.0	1.56	0.02

Table (4): Comparison of nurses' knowledge regarding hospital infection and patient safety dimension pre and post-system application (n=61)

Hospital and patient safety dimension	Satisfactory knowledge				χ2	p-value
	Pre system application		Post system application			
	No	%	No	%		
Most types of hospital infection	0	0	56	91.8	1.03	0.00
Dual identification during blood transfusion	13	21.3	57	93.4	3.11	0.03
Received the verbal order	7	11.5	58	95.0	1.56	0.02
Patient restriction	20	32.8	58	95.0	4.09	0.04
High-alert medications	14	23	60	98.3	1.48	0.04
RRT (rapid response team) code activated	0	0	56	91.8	1.03	0.00

Table (5): Comparison of total nurses' knowledge regarding risk management (n=61).

Nurses' knowledge	Pre system application Mean±SD	Post system application Mean±SD	t-test	p-value
Knowledge	58.34±6.22	88.42±14.76	60.32	0.00

Table (6): Comparison of nurses' performance regarding performance of risk management activities (n=61).

Performance dimension	Pre system application Mean±SD	Post system application Mean±SD	Paired t-test	P-value
Manage risks related to patient movement inside the hospital.	27.83±6.95	56.23±9.26	12.23	0.03
Manage risks related to hospital intervention procedures.	58.79±11.58	101.01±16.71	1.32	0.02
Manage risks related to providing nursing care.	50.05±7.21	90.25±11.62	4.56	0.03
Manage risks related to daily checks of medical equipment.	30.30±8.12	79.67±7.31	7.34	0.02
Manage risks related to not applying patient safety standards.	104.20±15.32	182.90±22.61	18.38	0.04
Manage Risks related to non-commit to incident reporting	29.06±7.11	78.53±12.15	7.34	0.02
Manage risks related to not applying infection control instructions.	45.03±7.059	88.73±15.93	13.24	0.04
Manage risks related to providing services in hospital departments.	43.63±5.56	77.51±8.38	2.78	0.02
Manage risks related to hospital infrastructure.	19.32±6.21	68.01±9.68	20.12	0.04
Manage risks related to non-commit by hospital plans.	37.98±7.97	76.38±8.31	7.45	0.04

Table (7): Correlation between nurses' knowledge and performance (n=61).

Variables	Total performance			
	Pre system		Post system	
	r	P-value	r	P-value
Total Knowledge	0.313	0.014	0.73	0.00

Table (8): Frequency and percentage distribution of personal and job characteristics of jury group (n=30).

Variables	Frequency	Percent
Job position		
Professor	9	30
Assistant professor	9	30
Lecturer	12	40
Department		
Nursing Administration	12	40
Medical Surgical	11	37
Quality	1	3
Infection control	1	3
Hospital accreditation	1	3
Nursing manager	4	13
University		
Ain Shams	20	67
Cairo	9	30
Helwan	1	3
Gender		
Male	10	33
Female	20	67
Experience years		
<10	12	40
10+	18	60

Table (8): Face validity of the proposed risk management system based on jury group agreement (no=30).

Statements	No.	%
The preliminary system looks like a nursing risk management system	30	100
The wording of the system is:		
Clear	30	100
Correct	27	90
Scientific	27	90
Appropriate	27	90
Understand	30	100
The system is free from any duplication.	30	100
The system is free from redundant items.	30	100
The tool covers all relevant aspects of a system	27	90
The system has a logical sequence.	30	100
There is a balance between the various sections.	30	100
The elements of the system are measurable	30	100
The title is appropriate for the system designing	30	100
The system reflects the required activities for nursing risk management.	30	100
The scale used in the system evaluation is appropriate	30	100
The dimensions of the system are:		
Clear	30	100
Enough for designing a risk management system	30	100

6. Discussion

Risk management in healthcare is a structured process to reduce the potential liability of healthcare providers, avoid harm to patients, stabilize insurance costs for healthcare providers, and protect hospitals from devastating financial losses. Risk management involves a proactive multidisciplinary approach to identifying risks, preventing loss, loss reduction, and risk financing *(Slawomirski et al., 2017)*.

This study was aimed at designing a nursing risk management system by conducting a baseline assessment of nurses' performance (knowledge and practice) for risk management, designing a nursing risk management system, validating the developed system, and assessing the effect of the designed nursing management system on nurses' performance for risk management.

Regarding knowledge of nurses' definition of risk, more than one-third of them had satisfactory knowledge pre-system implementation, increased to the whole sample got a satisfactory level post-system implementation with a statistically significant difference between pre and post-implementation regarding all the risk identification variables. This finding suggests that a notable portion of the nursing staff already possessed a reasonable understanding of risk-related concepts, though the majority still required improvement. The findings also demonstrate that the risk management system had a substantial positive impact on enhancing nurses' understanding. In agreement with this, *Mostafa (2009)* studied enhancing nurses' knowledge and

Table (9): Content validity of the proposed risk management system based on jury group agreement (no=30).

The proposed System Components	Agree	
	No.	%
Management process		
Planning		
Identify, analyze, and evaluate risks	30	100
Risk management action plan	30	100
Risk treatment	30	100
Risk register	30	100
Risk management policies	30	100
Organizing		
Risk management program	30	100
Risk manager duties	30	100
Formation of relevant committees	30	100
Define nursing procedures	28	93
Directing		
Motivate and encourage the nurse	29	97
Build a non-blame culture	29	97
Supervision	29	97
Communication reports	29	97
Controlling		
Risk management strategies	29	97
Continuous monitoring and review	29	97

awareness about risk management and found a highly statistically significant difference between pre and post-developing system results regarding their studied subject knowledge and awareness about risk management at the hospital.

Only about one-fifth of the studied nurses had satisfactory knowledge about proper documentation in nursing records in the pre-system application, which improved significantly for most of the nurses in the post-implementation phase. These results strongly suggest that the Nursing Risk Management System had a substantial positive impact on enhancing nurses' knowledge in key risk-related areas. The significant improvement across documentation practices and knowledge highlights the system's effectiveness in closing critical knowledge gaps.

In agreement with this finding, *Abd El-Kader (2013)* studied the factors affecting nurses' performance regarding documentation and clarified that all nurses had unsatisfactory knowledge regarding documentation accuracy related to patient information. In addition, *Perry et al. (2013)* highlighted that nurses do not erase, apply correction fluid, or scratch out errors made when recording because charting becomes illegible while drawing a single line through the error, writing the word error above it, and signing with the name or initials and title.

According to the present study, nurses' knowledge about the definition of patient fall was low before applying the new system. At the same time, there are highly statistically significant improvements in nurses' knowledge regarding all assessed variables post-system application. This result is due to the researcher's emphasis at a stage of system orientation on the importance of nursing knowledge of the patient's fall and compliance with nursing care plans. This improvement will likely contribute to enhanced patient outcomes, safer clinical environments, and better adherence to healthcare standards.

In disagreement with this, *Cho and Jang (2020)* studied nurses' knowledge, attitude, and fall prevention practices at South Korean hospitals: A cross-sectional survey and concluded that patient safety activities in small—and medium-sized hospitals can be enhanced by creating an environment that encourages active and self-directed participation in developing fall-prevention strategies using motivation and rewards.

None of the study nurses had satisfactory knowledge regarding hospital infection in the pre-system application. At the same time, there were highly statistically significant improvements in nurses' knowledge of post-orientation systems. This result may be attributed to the system's orientation, which emphasized the prevention of nosocomial infection as one of the patient safety goals.

Bawaqneh et al. (2025) disagree with the above finding and reported that most nurses demonstrated moderate to low knowledge. However, 63.5% exhibited a positive attitude toward infection control measures, and 72.9% demonstrated good practice levels.

Regarding "receiving verbal orders" there was a statistically significant improvement in staff nurses' knowledge regarding this dimension in the post-system application compared with the pre-application phase. This result may be due to the positive effect of the designed system on the study sample concerning receiving verbal orders, making sure that there is a witness from the medical team members, and using it only in cases of emergency. The designed system helps improve verbal orders according to quality standards that help in improving the health care provided.

Moghaddasi et al. (2017) reported an opposite finding in a study about verbal orders in medicine: Challenges, problems, and solutions. The results of this study indicated that the use of verbal orders, despite its advantages, is considered the cause of errors in the process of providing

healthcare. Therefore, reviewing and updating policies in healthcare centers is essential to ensure the proper implementation of orders, optimize patient safety, and reduce healthcare concerns.

The present study concludes that there was a significant statistical difference regarding total knowledge between pre- and post-risk management system implementation. The findings highlight that implementing the nursing risk management system improved nurses' overall understanding of risk management principles. This improvement is crucial for enhancing patient safety, ensuring proper documentation, and minimizing clinical errors. The statistically significant change underscores the system's success as an educational and practical tool in healthcare settings.

These findings matched those of *Ibrahim et al. (2023)*, who studied the effect of training to enhance nurses' performance regarding risk management at Port Said General Hospital and stated that pre-training, nurses' knowledge related to risk management dimensions was 47.7±20.2, which improved significantly post-training to 86.5±24.2. During follow-up, this percentage declined to 74.9±40.6.

The current study demonstrates high statistically significant improvements in nurses' performance of risk management activities' mean score after the system implementation compared to pre-system implementation regarding patient movement inside the hospital, intervention procedures, provision of nursing care, applying patient safety standards, incident reporting, infection control, providing hospital services, hospital infrastructure, and commitment to a hospital plan. These findings collectively indicate that the Nursing Risk Management System successfully improved nurses' practical skills and adherence to best practices across multiple dimensions of risk management. The presence of high statistical significance underscores that these improvements are substantial and unlikely to have occurred by chance. This outcome reflects better knowledge and enhanced application of that knowledge in daily practice, ultimately contributing to improved patient safety, care quality, and hospital efficiency.

Ibrahim et al. (2023) reported similar findings as pretraining, nurse's practice related to risk management dimensions, 32.1% of nurses' total practice was satisfactory before risk management training, which improved significantly post-training to 83.0% of them had satisfactory practice. During follow-up, this percentage declined to 75.4%.

The study also reveals a significant statistically weak positive correlation between total knowledge and total performance before applying a risk management system and a strong positive correlation after applying the designed system. This outcome underscores the importance of integrating education and practical application in healthcare interventions to improve patient safety and care quality.

In agreement with this result, *Mostafa's (2009)* study about enhancing nurses' knowledge and awareness about risk management reported that regarding the correlation between knowledge and performance results, there was highly statistically significant strong positive relation after

developing a risk management system. Additionally, *Bolbol et al. (2016)* reported a strong positive correlation between knowledge and performance, and the results were highly statistically significant after system designing.

Concerning the face validity of the proposed system for nurses, the present study findings reveal that the expert group expressed the view that the proposed system is comprehensive as it covers the expected steps. The exception was related to the system being written correctly, scientifically, and appropriately. Only three of the 30 jury group members disagreed with these items.

Jury groups agreed upon all remaining items regarding face validity. Therefore, the risk management system has acceptable face validity. The study results were in line with a study conducted by *Morsi et al. (2017)*, who stressed that the validation of any tool should be done by obtaining the academic expert's agreement upon its content, in addition to verifying its face validity.

Regarding the content validity of the proposed risk management system, the great majority of experts have agreed upon all items and sub-items of the proposed system, and their percentage agreement ranged from (93% to 100%). But they suggested some modifications and it was done accordingly. On the same line, *Polit et al. (2018)* stated that content validity is the degree to which the items of the proposed system adequately represent the universe of the content. This validation type is the most important type of validation. Thus, the proposed system is valid.

7. Conclusion

There was a highly statistically significant improvement in nurses' risk management knowledge and performance after system implementation compared with before system implementation.

8. Recommendations

Based on the findings of this study, the following are recommended:
- Maintain continuous auditing of patients' incident reports to detect and correct deficiencies.
- A similar study should be conducted in other hospitals to compare findings and generalize.
- Assess the effect of developing a risk management system on healthcare nurses' productivity.

9. References

Abd El-kader, H. A. (2013). Factors affecting nurses' performance regarding documentation in surgical units. Unpublished Master Thesis, Faculty of Nursing Ain Shams University, Egypt.

Bawaqneh, K. A., Ayed, A., & Salameh, B. (2025). Nurses' knowledge, attitude, practice, and perceived barriers of infection control measures in the intensive care units at Northwest Bank Hospitals. *Critical Care Nursing Quarterly, 48*(2), 160–171. https://doi.org/10.1097/CNQ.0000000000000538

Bolbol, S. A., Hassan, A. A., El-Naggar, S. A., & Zaitoun, M. F. (2016). Role of occupational health and safety

program in improving knowledge and practice among nurses exposed to chemotherapy at Zagazig University Hospital. Egyptian *Journal of Occupational Medicine, 40*(2), 219–235. https://doi.org/10.21608/ejom.2016.842

Cho, M. Y., & Jang, S. J. (2020). Nurses' knowledge, attitude, and fall prevention practices at South Korean hospitals: A cross-sectional survey. *BMC Nursing 19*(1), 108. https://doi.org/10.1186/s12912-020-00507-w

Esa, M., Ibrahim, F. S., Ishak, S. S. M., & Riazi, S. R. M. (2018). Impact of enterprise risk management on organizational performance, *Journal of Advanced Research in Dynamical and Control Systems*, *10*(6), 190-197.

Fraser, J. R. S., & Simkins, B. J. (2011). Enterprise risk management: An introduction and overview. Book Chapter. Pp.1-17. https://doi.org/10.1002/9781118267080.ch1

Iadanza, E. (2019). Clinical Engineering Handbook. 2nd ed. https://doi.org/10.1016/C2016-0-04298-5

Ibrahim, S. A., Aly, R. I. E., & Ghaith, E. E. (2023). Training strategy to enhance nurses' performance regarding risk management at Port Said General Hospital. *Port Said Scientific Journal, 10*(1), 110–129. Htttps://doi.org/0.21608/pssjn.2023.131174.1190

Moghaddasi, H., Farahbakhsh, M., & Zehtab, H. (2017). Verbal orders in medicine: Challenges; problems and solutions, *JOJ Nursing & Health Care, 1*(5), 001-006.

Morsi, E. S., Awad, A., Ismail, M., & Fekry, N. (2017). Effect of nursing management training program on nurse interns' managerial knowledge and skills in the emergency unit of El-Manial University Hospital Unpublished Doctorate Thesis, Faculty of Nursing, Cairo, Egypt.

Moskowitz, D., Stapleton, C., & Munichiello, K. (2022). The importance of healthcare risk management; Investopedia. Available at: https://www.investopedia.com/articles/personal-finance/072315/importance-healthcare-risk-management.asp

Mostafa, G. M. A. (2009). Enhancing nurses' knowledge and awareness about risk management: System design; *Eastern Mediterranean health journal = La revue de sante de la Mediterranee orientale = al-Majallah al-sihhiyah li-sharq al-mutawa*tir, *15*(5), 1135–1144.

Perry, A. G., Potter, P. A., & Ostendorf, W. R. (2013). Clinical nursing skills and techniques. 8th ed., Elsevier, Inc.: Canada. Pp. 50-53.

Polit, D., Beck, C., Hungler, B. (2018). Nursing research: Generating and assessing evidence for nursing practice. 8th ed., New York: Lippincott Williams and Wilkins and Wolters. Pp. 468-75.

Popov, G., Lyon, B. K., & Hollcroft, B. (2016). Risk Assessment: A Practical Guide to Assessing Operational Risks. 3rd ed. John Wiley & Sons Inc.

Rowland, B. L., & Rowland, H. (2000). Nursing administration handbook, 4th ed. Gettysburg, Maryland, Aspen, 9–41.

Saad, E. S. S. (2014). Effect of an educational program about intradepartmental communication among nurses on nurses' empowerment. Doctorate Dissertation, Faculty of Nursing, Benha University, Egypt.

Saker, R. G. A., Adam, S., & Hassan, R. M. (2019). Training as a means for improving staff nurses' documentation skills. *Egyptian Journal of Health Care*, *10*(1), 194-207. https://doi.org/10.21608/ejhc.2019.28800

Selim, M. F., Shazly, M. M., & Mostafa, H. A. (2019). Implementation of PDCA process of quality and measuring its effect on nurses' practice of patient safety goals. *Egyptian Journal of Health Care*, *10*(3), 218-233. https://doi.org/10.21608/ejhc.2019.59045

Shortreed, J., Hicks, J., & Craig, L. (2003). Basic frameworks for risk management. The Ontario Ministry of the Environment. Network for Environmental Risk Assessment and Management.

Slawomirski L., Auraaen A., & Klazinga N. S., (2017). The Economics of patient safety: Strengthening a value-based approach to reducing patients harm at national level. OECD Health Working Paper. No. 96, OECD Publishing, Paris, https://doi.org/10.1787/5a9858cd-en.

Smits, M., Zegers, M., Groenewegen, P. P., Timmermans, D. R., Zwaan, L., van der Wal, G., Wagner, C. (2010). Exploring the causes of adverse events in hospitals and potential prevention strategies. *Quality and Safety in Health Care, 19*(5), e5. https://doi.org/10.1136/qshc.2008.030726

Sullivan, E. J., & Decker P. J. (1987). Effective management in nursing, 2nd ed. New York, Addison–Wesley Publishing Company Health Science.

Thomas, C. (2020). Five major risk management challenges in the financial services sector. Available at: https://medium.com/@christhms6/5-major-risk-management-challenges-in-the-financial-services-sector-8a07e3d4a664

Tucci, L., & Stedman C. (2024). What is risk management? Importance, benefits and guide. Available at: https://www.techtarget.com/searchsecurity/definition/What-is-risk-management-and-why-is-it-important

Van Der Voort, H., De Bruijne, M., Steenhuisen, B. (2019). Roles of risk managers: Understanding how risk managers engage in regulation. *European Journal of Risk Regulation 10*(2), 376-392. https://doi.org/10.1017/err.2019.24