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Designing and validating a safety plan for patient in Intensive Care Unit

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Abstract: Background: There are emerging trends that correlate patient safety to positive results for patients, such as decreases in readmission and mortality rates, and an increase in patient satisfaction. Moreover, positive safety culture can also be related to a lower rate of adverse events. **Aim of the study:** This study was conducted to assess patients' risks in intensive care units to design and validate a safety plan for patients' safety. **Methods: Research design:** prospective observational design is used in this study. **Setting:** This study was conducted in two intensive care units, one at Mansoura and the second at Assuit University Hospital. **Subjects:** Three groups of subjects participated in this study; staff nurses N= (41), nurse managers N= (21) and an expert's panel N= (20). **Data collections tools:** two tools were used for data collection. **The patient risk assessment questionnaire** which includes two parts; the first part contains demographic data; the second part contained 63 risk associated items. The second tool involved validity forms to assess validity of the proposed patient safety plan. **Results:** the degree of risk in intensive care units ranged from low to moderate. The expert panel agreed on the validity of the proposed patient safety plan. **Conclusion:** After obtaining content validity and including the given risks, a safety plan was developed. **Recommendations:** Each hospital's critical care nursing staff, administrators and nurse managers, should examine how best to improve their work environment to decrease the risk in already vulnerable patients by participating in updating and dissemination of a patient safety plan.

Key words: Patient Safety, Plan, and Risks, ICU.

INTRODUCTION

The intensive care unit (ICU) is one of the most critically functioning operational environments in a hospital (Faith & Chdwick, 2013). It is known as an intensive therapy unit or intensive treatment unit (ICU). The ICU is a special department of a hospital that provides comprehensive and continuous care, and provides specialized services which are not available in general hospital wards (Kelly, 2016). The ICU caters to patients with severe and life-threatening illness, who require close monitoring and support from specialist equipment and medications in order to sustain organ functions (Aari et al, 2018; Bakker, Blanc, & Schaufeli, 2015).

A highly specialized team, which includes nurses, consultants, physiotherapists, dieticians and each of them with specialist knowledge and skills constantly look after and monitor patients in the intensive care units (Coomb s& Ersser , 2014). Nurses working in the ICU are responsible to ensure that critically ill patients and families receive optimal care and implementation of a patient safety plan as they become more steeped in the knowledge of patient safety (Kiarie p. 2011). Patient Safety is understood to be the minimally acceptable reduction of the risk of unnecessary harm associated with health care (Organizaçõo Mundial da Saõde 2011). Patients in intensive care units should be treated in a safe environment and protected from avoidable harm (Alli et al, 2008 & Sammer et al 2011).

An incident or incident of patient safety is an event or circumstance that may have resulted in or resulted in unnecessary damage to the patient. Incidents that cause

harm to the patient are called adverse events, that is, the damage is caused by health care, which was not caused by the underlying disease, which can prolong the patient's time of permanence or result in a present incapacity at the moment of hospital discharge (Ministério da Saõde (BR) 2014). Thus, assessing the occurrence of an adverse event involves distinguishing between undesirable results caused by problems in the quality of care and those resulting from the patient's inherent risk factors and the severity of the case, which define the prognosis and odds of survival (Martins M et al, 2011) Therefore, critical care presents significant patient safety challenges. Modern intensive care of severely critically ill patients is a fast paced, complex, and high risk environment (Occupational Safety and Health Administration, U.S. Department of Labor, 2012).

Many factors could potentially result in an increased rate of errors and adverse events that in the critically ill, may lead to fatal consequences. There are many different ways to categorize adverse events and the lack of consensus regarding the definition of an adverse event can sometimes be confusing. The concept of adverse event is related to the occurrence of harm or injury caused by medical care rather than by the underlying disease. Some adverse event studies mainly focus on the incidence of medical complications, e.g., nosocomial infections, accidents during central venous puncture, peripheral thrombosis, pulmonary embolism, gastrointestinal bleeding, etc. (Orgeas MG et al, 2008 & Kesecioglu, 2014). Other studies apply a wider approach when attempting to classify the adverse events as human/staff errors, medication/drug errors, and equipment errors. However, depending on the philosophical approach,

almost all errors may be classified as human. For example, when a ventilator has an electrical malfunction, it is probably due to poor engineering or industrial design. (Medcom Trainex, 2015).

The classification by Valetin and colleges 2006 is easier to understand and more applicable in daily intensive care. They classify adverse events depending on the type of event and in order of frequency in their study (lines, catheters, drains; medication; equipment; airways; and alarms). Equipment failures are a common denominator in many adverse event studies. Welters and colleges found that almost 30% of critical incidents were related to wrongful use of equipment and faulty equipment (Welters ID etal 2011;Gaber, 2013&Sacadura-Leite et al 2018).

Developing patient safety plan is a good idea to look at a wide variety of potential hazards that could occur to patients in the workplace. It includes information about all potential sources of hazards. Developing a safety plan means doing a hazard assessment to determine what, if any, physical or chemical hazards in your workplaces could affect patients' safety. The Plan provides a planned and quantifiable approach for the management of Health & Safety for patients (Kwesi & Justice.2016).

Aim of the study:

This study was conducted to assess staff nurse and nurse manager perceptions of patient risk in intensive care units at Main Mansoura and Assuit University Hospital and to design and validate a safety plan for patients

Research questions:

1. What are the most common patient risks in Intensive Care Units at Main Mansoura and Assuit University Hospitals?
2. What categories are essential to a safety plan for patient in Intensive Care Units at Main Mansoura and Assuit University Hospitals?

SUBJECTS AND METHODS

Research design:

A prospective observational cross sectional design is used in this study to describe the risks to patients and to develop a safety plan to reduce these risks.

Setting:

This study was conducted in two intensive care units (traumaICU at Mansoura hospital and general ICU at Assiut University Hospitals). The units have 30 beds (Mansoura ICU 22 beds and Assiut ICU 8 beds).

Subjects:

To collect data for the present study, three separate samples were used:

Staff nurses:

A convenience sample of forty one staff nurses were recruited from the selected settings according to the recruiting criteria.

Nurse Managers:

This group consisted of 21 nurse managers (nursing director and assistants, nursing supervisors, and heads nurses) from Mansoura and Assuit University Hospitals.

Experts' panel:

The panel consisted of 20 members, 10 academic staff in faculty of nursing and 10 from nursing administrators / leaders and quality management specialists.

Inclusion criteria:

The inclusion criteria for this sample were nurses working in the selected setting for at least one year prior to the data collection to be able to express opinions about patient risks.

Ethical consideration:

A research proposal was presented to the Ethics Committee at the Faculty of Nursing Mansoura University and approved. Each ICU coordinator was informed about the study and provided their oral support and written consent to the study. Participants were given information about the study to help them make an informed decision about participation. Written consent was obtained from each study participant.

Data collection process:

The data collection included four phases:

Phase one: Patients risk assessment phase which included various steps

Development of the Patient Risk Assessment Questionnaire:

This questionnaire was developed by the researchers based on literature review (The Joint Commission 2012 & Braun, Rihle Donofrio and Hafiz (2012) & Gaber 2013) to collect data about patient risks in the ICU. The questionnaire has two parts; the first part contained demographic information. The second part contained (63**risk associated items**) divided into 10 dimensions titled ,Biological risk (4 items) Nurses' performance error (5 items) ,Environmental risk (8 items), Chemical risk (4 items), Medical and surgical error (12 items) ,Blood related risks (7 items) ,Risks associated with report of injuries and incidents (5 items), Hospital system errors (8 items), Psychological risks (6 items),and Factors predisposing to accidents (4 items).

- 1- Risks were computed using: the system of: 1) identification of hazards and, 2) exposure to hazards.
- 2- Exposure to hazards was measured through defining the following criteria:
(A) Frequency: severity assessment of the frequency.
(B) Probability of occurrence of the patient or impact
(C) Likelihood or probability.
- 3- The researchers adopted risk as explored in table (1).

Validity & Reliability of the questionnaire:

The researcher give the questionnaire for 9 experts in critical care nursing and medicine to examined the document and their recommendations were utilised to improve the quality of the questionnaire. The reliability of the questionnaire was analyzed in an internal consistency study, through the calculation of Cronbach's alpha which was 0.93. This indicator measured the level that the translated items are related within each dimension of the safety culture and in the whole survey. That is, the higher the covariates and correlations are, the higher will be the consistency of

measure in the same dimension or the concepts. Regarding the reliability of dimensions and of the full survey, Cronbach's alpha higher than 0.6 is considered as acceptable

reliability, higher than 0.7, good reliability, and higher than 0.9, excellent.

Table (1) the scale of assessing the parameters of risks:

Value Parameter	1	2	3	4
Frequency	One time or less each year	One time or less each month	One time or less each week	One time or more each shift
Impact	First aid only	Medical treatment	Loss of time or workdays	Temporary/permanent partial/total disability or death
Probability	It is extremely unlikely the incident occurred one time in more than 20 years	It is unlikely the incident occurred one time of 10-20 years	Incidents Expectations from 10-20 years	Incidents expectations one time or more each year

Phase two: conducting the questionnaire of the risk assessment:

- 1- The researcher administered the risk assessment questionnaire to the participants, one copy for each to assess the extent to which participants perceived a strong and proactive organizational commitment to patient safety.
- 2- The responses were scored on a scale from one to four for the previous three parameters A, B and C successively. Therefore, the responses ranged from minimum of 1 (1×1×1) to a maximum of 63 (4×4×4). The responses ranked as; 1) 1-≤8 = negligible risks, this means that the hospital can control these risks according to availability of solutions, 2) 8-<27 = low or acceptable risks, this means that the hospital should control these risks within a month, 3) 27-<56 moderate risks, (this means that the hospital should control these risks within a week and 4) 64 means high, severe, substantial or intolerable risks, this means that the hospital should control these risks within a day or immediately.

Phase three: educating the participants about safety:

- Once the questionnaire was completed, the researcher conducted presentations on the concept of patients safety to all participants in two presentations 40-minute for each.
- The objectives of these sessions were to help participants understand the following: patient safety is a significant problem and efforts to improve safety should focus on improving systems rather than blaming care providers.
- They were scheduled and held in private locations, with an authorized audio recording through a Consent form, and had an average duration of 40 minutes.

Phase four: designing patient safety plan:

This phase was conducted through different steps including the following:

Step one:

At this step, an organized manual and internet search was conducted to find the essential elements of a patient safety plan. A systematic search by combination of words with “and” and “or,” in databases that included Science Direct (Elsevier), Wiley-Blackwell, complete STM collection, Nursing consult, Oxford Journals Medicine, PubMed, and CINAHL was conducted. Relevant English language articles up to 2018 were selected based on the study questions.

Step two:

- Based on the data obtained from the systematic search of existing articles and reference books, the essential elements of the safety plan were aggregated.

The plan included four sections:

- 1- The first section was about the goals of the designed plan which included:
 - Diagnosis of the existing risk and danger for the patients
 - Implementation of preventive interventions to address risks.
 - Increasing staff awareness about safety culture.
 - Overcoming barriers to patient safety.
 - Improving the quality of care.
- 2- The second section was about the steps to implementing the safety plan
- 3- The third section was about the responsibilities of the team.
- 4- The fourth section was about the outcomes indicators.

Step three:

The designed plan was sent via e-mail to the panel of experts after obtaining their consent through a phone call before sending them the designed plan followed by a letter explaining the objectives of the research and the consent form to assess the content validity of the design within one month for the return of the analysis of the safety plan. Content validity refers to experts’ evaluation on the items of the instrument, verifying the representativeness and extension of each item in the validation of the phenomenon studied, as well as the dimension of each item within what is being investigated.

Step four:

The safety plan was evaluated by individual items, and in a global way, considering six requirements: feasibility (measure is applicable), objectivity (allows for on-time responses), simplicity (expresses a single idea), clearness (clear, simple and indubitable demonstration), pertinence (does not imply discrepant attribute from what was defined) and accuracy (each assessment item is different from the others and allows regularity in the execution). At the end of each assessment item, the participants justified their responses and provided suggestions (open space) for the instrument.

For the analysis of the safety plan items, the participants followed the Likert scale, with four levels: 1 (not relevant or not representative), 2 (item needs major revision to be

representative), 3 (item requires a small revision to be representative), and 4 (relevant or representative item).

Statistical Analysis:

Data were analyzed and summarized using percentages for categorical variables and means and standard deviations for

numerical variables. Scores are presented as absolute values and as a mean for total means of each type of risks. Total means depend on the number of items of each risk type. Quantitative variables were compared using chi

RESULTS

Table (2): Demographic characteristics of the staff nurses and nursing managers

Characteristics	Staff nurses N=41		Nursing managers N=21	
Age(in years)	NO	%	NO	%
28-	8	3.28	7	33.33
33-	12	34.14	11	52.38
38-	13	31.7	3	14.28
43+	8	19.5	---	
Educational qualification				
Bachelor of science	23	56.09	18	85.71
Secondary nursing diploma	18	43.90	3	14.28
Experience (in years)				
10	10	24.39	4	19.04
10-15	13	13.92	12	57.14
15	18	43.90	5	23.80
Marital status				
married	35	85.3	19	90.476
Single	6	14.63	2	9.523

Table (2): shows demographic characteristics of the staff nurses and nursing managers. Accordingly, staff nurses age ranged between 28 and 43 years old, 35 are married, 23 had Bachelor of Science in nursing and 18 had secondary nursing diploma. And nearly half of the nurses (43.9%) had

15 years of experience. while nurses’ managers’ age ranged between 28 and 38 years old, 19 are married, 18 had Bachelor of Science in nursing, and 3 had secondary nursing diploma. And 57.14% of them had 15 years of experience.

Table (3): Mean and Standard deviation of staff nurses opinions about patient risk in Intensive Care Units(n=41)

Risks types	Risks Categories				Risk degree
	Severity	Frequency	Probability	MM**	
	M*±SD	M*±SD	M*±SD		
Biological risks (6 risks)	3.35±2.580	3.52±5.302	3.54±6.644	41.743	Moderate
Nurses’ performance error (11 risks)	3.57±4.991	3.43±7.666	3.71±2.822	45.429	Moderate
Environmental risk(16 risks)	3.27±2.771	3.56±4.001	3.34±2.988	38.881	Moderate
Chemical risks (4 risks)	2.33±6.533	2.19±3.908	1.65±5.556	8.419	Low
Medical and surgical error risk (16)	3.24±1.422	2.45±3.455	1.96±1.633	15.558	Low
Blood related risks (8 risks)	3.27±.089	3.63±2.817	3.23±2.066	38.340	Moderate
Risks associated with report of injuries and incidents (12 risks)	3.51±2.960	3.25±2.333	3.26±5.008	37.188	Moderate
Hospital system errors (20 risks)	3.56±5.316	2.93±4.883	2.98±5.625	31.083	Moderate
Psychological risks (6 risks)	3.43±1.343	2.76±1.380	2.44±2.006	23.098	Low
Factors predisposing to accidents (13 risks)	3.64±4.829	2.95±6.493	3.24±3.602	34.791	Moderate

M*= Mean of means of all risks under each type, MM**= Multiplying Mean of Means

Table (3): shows Mean and Standard deviation of staff nurses opinion about patient risk, it demonstrates that the risks in ICU at Mansoura and Assuit University ranged between low to moderate degree. As regard, the table the risks were at low degree for chemical risk, psychological risk, and medical and surgical risk, (8.419, 23.098, 15.558.,

respectively). And, the table demonstrates that the patient risks were at moderate degree for, blood related risks, biological risk , environmental risk, risk associated with report of incidents and injuries ,hospital system errors risk and predisposing factors to accidents (38.340, 41.743, 38.881, 37.188 31.083 and 34.791, respectively)

Table 4): Mean and Standard deviation of nursing managers opinions about patient risk in Intensive Care Units(n=21)

Risks types	Risks Categories				
	Severity	Frequency	Probability	MM**	Risk degree
	M*±SD	M*±SD	M*±SD		
Biological risks (6 risks)	3.52±6.166	3.17±3.901	3.27±6.886	36.487	Moderate
Nurses' performance error (11 risks)	3.62±5.213	2.89±3.098	3.53±6.080	36.930	Moderate
Environmental risks (16 risks)	3.37±6.007	3.30±3.512	3.50±4.903	38.923	Moderate
Chemical risks (4 risks)	2.33±7.302	2.74±9.493	1.70±6.351	10.835	Low
Emergency errors (7 risks)	3.07±3.854	2.16±7.555	1.40±3.001	9.283	Low
Medical and surgical error risk (16)	2.84±2.686	2.57±6.280	1.89±2.622	13.794	Low
Blood related risks (8 risks)	2.41±5.019	2.95±8.901	2.03±5.113	14.432	Low
Risks associated with reports of injuries and incidents (12 risks)	3.17±4.766	3.56±7.308	3.21±6.022	36.225	Moderate
Hospital errors risks (20 risks)	3.23±4.404	2.96±8.007	3.21±5.775	30.690	Moderate
Psychological risks (6 risks)	3.37±2.434	2.84±6.607	2.45±5.781	23.448	Low
Factors predisposing to accidents (13 risks)	3.24±8.312	3.35±9.430	3.37±3.966	36.577	Moderate

Table (4): shows Mean and Standard deviation of nurses' managers' opinion about patient risk, it demonstrates that the risks in ICU at Mansoura and Assuit University ranged between low to moderate degree. As regard, the table the risks were at low degree for chemical risk, psychological risk, blood related risk and emergency risk, and medical and surgical risk (10,835, 23.448, 14.432, 9.283, and 13,794

respectively). And, the table demonstrates that the patient risks were at moderate degree for, biological risk ,nurses performance risk, , risk associated with report of incidents and injuries ,hospital system errors risk and predisposing factors to accidents(36.487, 36.930,36.225,30.690 and 36.577, respectively)

Table (5): Frequency and Percentage distribution of Jury group agreement and validation of proposed health and safety plan (n=20)

The proposed risk management plan	Academic Staff (n=10)		Nursing Administration Staff (n=10)		X ²	P	
	No.	%	No.	%			
General characteristics: the proposed plan:							
Proposal submitted looks like patient safety plan	8	80	10	100	0.32	1.00	
proposal patient safety plan has complete elements	9	90	10	100	0.32	1.00	
Looks like a risk plan	9	90		10	100	0.32	1.00
Complete	8	80		9	90	0.36	.691
Relevant	9	90		8	80	0.41	.456
Feasible	9	90		9	90	0.17	1.00
Reliable	8	80		7	70	0.49	.120
Written in professional context	9	90		9	90	0.45	.476
Has understandable language	9	90		8	80	0.29	.721
Specific characteristics:							
1- Goals:							
Complete	9	90		9	90	0.16	.951
Clear	9	90		8	80	0.11	1.00
Summarized	9	90		7	70	0.19	.483
Understandable	8	80		7	70	0.21	.979
Appropriate	7	70		7	70	0.39	.643
Practical	8	80		8	80	0.23	.183
In logical sequence	8	80		9	90	0.34	.896
Applicable	9	90		8	80	0.26	.742
Measurable	8	80		9	90	0.18	1.00
2- Implementation steps:							
Complete	9	90		9	90	0.12	.446
Clear	8	80		8	80	0.14	.804
Detailed	8	80		8	80	0.12	.641
Applicable	8	80		7	70	0.35	.493
Follow scientific methods	9	90		9	90	0.31	.873
In logic sequence	9	90		8	80	0.17	1.00
Covering all steps	8	80		8	80	0.11	1.00

No overlapping	9	90	9	90	0.15	1.00
Measurable	9	90	7	70	0.16	1.00
3- Responsible team for application:						
Appropriate assignment for each person.	7	70	9	100	0.86	.079
4- Indicators of outcomes (goals achievement)						
Complete	6	60	8	80	0.16	1.00
Measurable	10	100	10	100	0.13	1.00
Attainable	9	90	10	100	0.68	.476
Clear	9	90	10	100	0.11	1.00
Observable	9	90	10	100	0.11	1.00

Content validity index=0.84

Table (5): shows expert panel agreement and validation of the proposed patient safety plan. The results in this table revealed that there no significant difference between both groups of jury in relation to agreement and validation of proposed patient safety plan. The content validity of patient safety plan was 0.84%. And, the proposed plan was agreed by most of expert panel. In addition, they agreed by 90% on most of patient safety plan items and contents. The lowest academic staff agreement 60% was about the complete Indicators of outcomes (goals achievement) while the lowest nursing administration staff agreement 70. % was about - Implementation steps applicability and Understandability and Appropriateness of goal

DISCUSSION

Few studies were carried out with the particular purpose of identifying an association between hospital deaths and adverse events. Generally, studies have focused on evaluating specific situations such as surgical cases and hospital infections (Zegers M et al,2009 & Marang-van de Mheen PJ et al,2007). The patients require intensive care and monitoring to support them while they recover from the underlying disease or injury. By creating a safe environment, patients can feel safe and caregivers feel comfortable reporting errors and suggesting patient safety-related improvements (Joint Commission on Accreditation of Healthcare Organizations, 2010). Results of the present study indicated that the patients' risks in intensive care units ranged from low to moderate for chemical risk, psychological risk, and medical and surgical risks as perceived by staff nurses. This may be related to less patient exposure to antiseptic solutions or chemical substances.

These results are supported by Boersma and Linton (2005), who highlighted the importance of identifying patients at risk. Also, the American Association of Critical-Care Nurses has indicated the importance of a healthy work environment and the potential link between the environment and patient safety Kelly,D (2014). Indeed clinical risk management focuses on improving the quality and safety of health care services by identifying the circumstances and opportunities that put patients at risk of harm and acting to prevent or control those risks (Asefzadeh, Mohammad, Ahmad, and Golrokh ,2013).

Results of the present study indicated that the patient risk in ICU was moderate as perceived by staff nurses for, blood related risks, biological risk, environmental risk, risk associated with report of incidents and injuries, hospital system error, risk and predisposing factors to accidents. This may be related to moderate blood reaction, wrong blood

group, expired blood intravenous, extravasation, blood rate infusion ,moderate patient exposure to airborne infection, infectious diseases oral transmission, infectious disease direct contact transmission, moderate bedsores, patient falls, burn exposure, inadequate light, inadequate format to report of accident and injury, bad reports, no accident documentation, inappropriate supervision, inadequate policy and regulation about patient safety, absent of a plan to protect patients from accidents, no follow up after accidents, and length of stay.

These results are supported by the work of Dzik (2003) who stated that errors in blood transfusion are serious forms of medical error. They have, been neglected since the focus of adverse outcomes to blood transfusion remains on the safety of the blood product itself. There is a need to address the substantial risk that human process errors have on patient safety during blood transfusion. Also the National Institute for Health and Care Excellence (2013) indicated that all healthcare professionals dealing with patients known to be at risk of falling should develop and maintain basic professional competence in falls assessment and prevention. In addition Bernard L, Biron , Lavoie-Tremblay (2018) raised concerns about infection practices. Similarly, (Awasthi, Dixit, and Sharma, 2010)stated that recent advancements in technology have created an immensely complex healthcare system. This complexity brings many challenges for healthcare staff in continuing to keep the patient safe.

Regarding to staff mangers perception to patients risks was from low to moderate. Patient risks were at low for chemical risks, psychological risks, blood related risks and medical and surgical risks. This may be related to low exposure to chemical substances, low patients exposure to violence, low exposure to blood reaction and to medication error. These results are supported by (Fordyce et al, (2003) who reported errors occurring in busy emergency units for every 100 hours worked and categorized errors as 22% diagnostic studies, 16% administrative procedures, 16% pharmacotherapy, 13% documentation, 12% communication, 11% environmental, and 9% other.

The nurses' managers' perception was moderate for, biological risk, nurse performance, and risk associated with report of incidents and injuries, hospital system errors and predisposing factors to accidents. These results may be due to availability of equipment for some airborne biological hazards in intensive care unit, and that nurses protect themselves and the patient by good performance in the fight against hazards. These results extend the work of (Pearson and Aromataris (2009) who stated that any analysis of

patient safety requires a consideration of the potential hazards in a patient unit and of the risk of these hazards occurring and their consequences.

The expert panel in this study reached agreement and validation of the proposed safety plan for ICU at Main Mansoura and Assuit University Hospital. These results extend the work of (Henriksen, Battles, Keyes, Grady 2008) who indicated that the Joint Commission, Institute for Healthcare Improvement (IHI), the National Quality Forum (NQF), and the Accreditation Council for Graduate Medical Education (ACGME)—have cited the importance of patient safety. Also Watters and Truskett, (2013) stated that the risk of error can be minimized by good situational awareness, matching perception to reality, and, during treatment, reassessing the patient, team and plan. Furthermore, these findings were in line with (Andrade L. et al 2017) that developed and validated a safety culture survey for Brazilian. Also, Pronovost P et al 2005 implemented and validated a comprehensive unit-Based Safety program.

CONCLUSION

Use of a precise patient safety plan leads to reduction of risks as the health team can detect these risks through following this plan. After obtaining content validity and including the given indications, the present study explored that the developed patient safety plan validated and approved by the experts were considered essential to establish and maintain an effective health and safety management system to protect patients' safety.

RECOMMENDATIONS

Based on the finding of the present study, the following recommendations were developed:

- Using an evidence-based guide to create a plan. The plan explains how to take essential steps, lay out the evidence and identify best practices, analyze care delivery, track performance with interventions, and continue to improve.
- Periodic evaluation should be done to ensure safe practice of nursing care in order to prevent health risks and protect patients' safety.
- Researchers and scientists look forward to cooperate with health administrators and stakeholders to fulfill the vision of a safer, high-quality health-care system that serves all people equally and efficiently.
- Continue education programs for all nursing staff about patient safety plan and how of their duties and responsibilities in implementation to improve patient safety and quality of care.
- Nurses' performance evaluation should be based on nurses' roles in patient safety plan.
- Each hospital's critical care nursing staff, led by administrators and nurse managers, should examine how best to improve their work environment to decrease the risk in already vulnerable patients.

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