



## RESEARCH ARTICLE

# A comparative study of patient safety in the intensive care units

Foroozan Atashzadeh-Shoorideh<sup>1</sup>  | Azam Shirinabadi Farahani<sup>2</sup>  |  
 Amir Hosein Pishgooie<sup>3</sup> | Mohadese Babaie<sup>4</sup> | Nazanin Hadi<sup>4</sup> | Maryam Beheshti<sup>4</sup> |  
 Ensieh Fathollah Zadeh<sup>5</sup> | Victoria Skerrett<sup>6</sup>

<sup>1</sup>Department of Psychiatric Nursing and Management, School of Nursing & Midwifery, Shahid Labbafinezhad Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>2</sup>Department of Pediatric Nursing, Nursing & Midwifery School, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>3</sup>Aja University of Medical Sciences, Tehran, Iran

<sup>4</sup>Student Research Committee, School of Nursing & Midwifery, Shahid Beheshti University of Medical Sciences, Tehran, Iran

<sup>5</sup>School of Nursing & Midwifery, Flinders University of Medical Sciences, Adelaide, Australia

<sup>6</sup>School of Nursing & Midwifery, Birmingham City University, Birmingham, UK

## Correspondence

Azam Shirinabadi Farahani, Department of Pediatric Nursing, Nursing & Midwifery School, Shahid Beheshti University of Medical Sciences, Tehran, Iran.  
 Email: [farahani1381@yahoo.com](mailto:farahani1381@yahoo.com)

## Funding information

Shahid Beheshti University of Medical Sciences; Shahid Beheshti University of Medical Sciences

## Abstract

**Aim:** This study aimed to assess patient-safety principles in ICUs.

**Design:** This is a descriptive-comparative study.

**Methods:** The research environment includes ICUs of hospitals affiliated to the two universities of medical sciences in Tehran. Sampling was done by census using Time and Event Sampling methods. Research instrument was "Patient Safety Principles Checklist". Data analysis was performed using SPSS-20 and descriptive-inferential statistics with a significance level of 0.05.

**Results:** There is no significant difference ( $p$ -value = .15) in the level of observance of patient-safety principles in two university-affiliated hospitals A ( $133.26 \pm 9.14$ ) and B ( $128.16 \pm 18.01$ ). Evaluation of the mean scores obtained in each dimension and in each of the ICUs was showed that only in dimension No.3 the difference was significant ( $F[68,2] = 5.20$ ,  $p$ -value = .008) and in the AICUs ( $16.13 \pm 1.8$ ) ( $p$ -value = .04), it was significantly lower than other ICUs. Identifying risk factors for the patient's immunity reduces the side effects of patient care.

## KEYWORDS

health professionals, hospitalized patients, intensive care units, nurses, patient safety

## 1 | INTRODUCTION

According to WHO, patient safety is the absence of preventable harm to a patient during the process of health care and reduction of risk of unnecessary harm associated with health care to an

acceptable minimum (WHO, 2020). Patient safety is often assessed based on 5 outcomes: infections, injuries, errors, adverse events, and mortality, but these consequences are a passive way of accessing patient safety. Because they are evaluated when the patient's safety is threatened, therefore, the combination of these messages with the

This is an open access article under the terms of the [Creative Commons Attribution-NonCommercial-NoDerivs](https://creativecommons.org/licenses/by-nc-nd/4.0/) License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *Nursing Open* published by John Wiley & Sons Ltd.

causative agent introduces a new combination in patient safety assessment, which includes state policy, diagnosis, medications, surgical operations, infections, and injuries (Ismail & Nasir, 2017; Miladinia et al., 2016; Thomas & Petersen, 2003). Moreover, the decisive role of the environment of health organizations and the prevailing safety culture in the performance of the nursing team in providing safe care is not hidden from anyone (Alves & Guirardello, 2016).

Nurses have a significant role to play in promoting patient safety in the healthcare system. Patient safety aims to reduce errors, injuries, and mortalities that occur to the patients, it is one of the main concerns of nurses and the healthcare system (Lotfi, Atashzadeh-Shoorideh, Mohtashami, & Nasiri, 2018; Thomas & Petersen, 2003). Patient safety is an important priority in the National Health Service (Hemmat, Atashzadeh-Shoorideh, Mehrabi, & Zayeri, 2015). Since the components of high-quality care in this century are safe, effective, patient-centred, timely, efficient and equitable care; therefore, maintaining patient safety has received much attention in recent years (Lotfi, Atashzadeh-Shoorideh, Mohtashami, & Nasiri, 2018). Particularly over the last 22 years, following the US Institute of Medicine Report on "Err Is Human" (Donaldson, Corrigan, & Kohn, 2000), serious and widespread attention has been paid to addressing unsafe care problems in the healthcare system.

Some studies suggested that millions of patients die each year because of unsafe care (George, 2017; Jha, Prasopa-Plaizier, Larizgoitia, & Bates, 2010). Despite the increasing development of safety guidelines, medical centres still face challenges regarding patient safety. About 2.9%–16.6% of hospitalized patients are affected by adverse events due to unsafe care (Ramos & Calidgid, 2018). One in ten patients is harmed while receiving hospital care in the United States (Kalroozi & Joolae, 2018), and more than 16% of patients experience at least one adverse event in hospital (Stocker, Pilgrim, Burmester, Allen, & Gijsselaers, 2016). Despite the great efforts made by National Health Service to formulate healthcare policies and medical education, there is a considerable amount of unsafe care. Therefore, the presence of qualified and skilful healthcare providers is also essential to achieve patient safety goals.

## 2 | BACKGROUND

Patients in the ICUs are more likely than patients in other areas to experience safety issues in the hospital including medical errors (Karlsen, Ølnes, & Heyn, 2019; Wilcock et al., 2013). Advanced equipment and new treatment methods, critically ill patients in an unstable condition, as well as a heavy nursing workload adversely affect patient safety (Brunsveld-Reinders, Arbous, De Vos, & De Jonge, 2016; Nasrabadi et al., 2019; Wei, Niu, & Ge, 2019). Adverse events due to unsafe care in neonatal intensive care units (NICUs) have been increasing in recent years (Lanzillotti, Seta, Andrade, & Mendes Junior, 2015; Truter, Schellack, & Meyer, 2017). Therefore, 78% of infants experience at least one or more medical errors during hospitalization (Truter et al., 2017). The occurrence of adverse events due to unsafe care in PICUs is three times higher than in other

paediatric wards. More than half of the adverse events are related to errors in medication (Guise et al., 2017). In addition, more than 300,000 patients in ICUs are at risk of unsafe care each year, while more than a third of them can cause serious harm to the patient (MacFie, Baudouin, & Messer, 2016).

Failure to maintain patient safety is a leading cause of injury and avoidable harm in patients. Failure to improve patient safety can be quite serious and leads to prolonged hospital stays, and temporary or permanent disability in the patient (Bartman, Bertoni, Merandi, Brady, & Bode, 2019). In addition, national and international policies have emphasized the importance of patient safety and tried to improve it in their care, following the report of the American Medical Institute on the "possibility of human error", a large-scale movement was launched to investigate the factors affecting patient safety (M. Ridberg, K. Roback, & P. Nilsen, 2020a, 2020b). Researchers have increasingly studied various aspects of patient safety. For example, in a study in intensive care units, the level of safety in performing invasive procedures such as vascular access was assessed and the results showed that the performance of nurses in this dimension was inappropriate (H Bayatmanesh, Zagheri Tafreshi, Mnoochehri, & Akbarzadeh Baghban, 2017) or another study showed that care providers did not perform in accordance with safety standards in cases such as drug dose calculation, attention to drug interactions, or taking necessary action on medications that required special attention (Mirzaei, Khatony, Faramani, & Sepahvand, 2013). Patient safety and risk management in the form of accreditation of hospitals, and the centres that provide medical nursing services, indicates the need to prevent injury to the patient and maintain patient safety (Hospital accreditation system, 2019).

The aim of this study was to assess patient safety on the basis of a nine-dimensional "patient safety principles checklist" in neonatal, paediatric and adult intensive care units. By identifying the factors threatening the patient's safety which according to the review of kinds of literature and available tools in the nine dimensions including similar and high-alert medications, drug accuracy in the service delivery process, correct identification of a patient, effective communication at the time of patient transfer, correct procedures, hand washing, use of disposable devices (such as syringes), avoidance of incorrect connections of catheters and tubes, and maintenance and control of the concentration of electrolyte solutions are summarized, managers of hospitals and other care centres will be able to take action to strengthen human resources and also, eliminate the inconsistencies between the workload and the number of care providers within the organizations to provide continuous and safe care according to the patient's needs. Because the establishment of safety in the patient can affect the patient's satisfaction and length of hospital stay, nursing motivation, job satisfaction, nurse absenteeism and retention and ultimately improve clinical management conditions (Alves & Guirardello, 2016; Lake, Germack, & Viscardi, 2016).

Due to the fact that accurate statistics on the level of patient safety in ICUs are not available in the country. The purpose of this study is to investigate the nine dimensions of safety in different levels of ICUs to identify the sources of error to improve safety in

such wards. This would be confronted with too many errors due to the special and variable physical condition of patients, therefore the need for rapid and emergency measures.

### 3 | LITERATURE REVIEW

Patients admitted to intensive care units are often in a critical and threatening situation that requires safe care in terms of mechanical ventilation, haemodialysis and plasmapheresis (Gordo & Abella, 2014). Therefore, the issue of safety is the most key aspect of the quality of care (Mikaela Ridelberg, Kerstin Roback, & Per Nilsen, 2020a, 2020b; Tahmazi Aghdam, Nafar, Aghaei Hashchin, Abbasi Chaleshtari, & Salehi, 2021). Hence, evaluating patient safety and safe care, identifying harmful intervention, the concept of patient safety culture, and its promotion in the health care system, is the concern of researchers in this field.

Numerous safety studies have been executed on the safe performance of nurses and their compliance with the safety standard in three domains of tracheostomy suctioning, gavage, and extubation (Dehghani, Nasiriani, & Mousavi, 2014), dimensions of admission, and initial evaluation of the patient, performing the correct procedure in the right location, avoiding inappropriate connections of the patient's tubes and catheters, falling down prevention, preventing ulcer and nosocomial infections (H Bayatmanesh et al., 2017), and areas of attention to drugs with similar names and pronunciations and ensuring the correctness of drug therapy, gavage, prevention of embolism and venous thrombosis, blood transfusion and prevention of its complications, surgical complications, and ventilator and endotracheal tube (Habibeh Bayatmanesh, Zagheri Tafreshi, Manoochehri, & Akbarzadeh Baghban, 2019). The results of these studies indicate adverse compliance of nursing care with safety standards.

### 4 | METHODS

The present study is a descriptive-comparative study in which the level of patient safety was examined in the ICUs of hospitals affiliated to the two universities of medical sciences in Tehran. The two centres were chosen due to ease of sampling and a similarity in the type of ICUs under review.

#### 4.1 | Sampling and data collecting

After the identification of the hospitals, the objectives and methods of the study were explained to the authorities. Sampling was done by census and samples have been selected by event and time sampling. During the event sampling, researchers were present at ICUs during special procedures related to the principles of patient safety and observed and reviewed these measures based on a standard checklist. The patient's surgical site is marked (e.g. phrase 46, Dimension

of correct procedures). At time sampling, researchers attended selected hospitals in three shifts in the morning, evening and night, and observed how nurses applied the principles of patient safety based on a prepared checklist (Personnel has the necessary knowledge about hand rub (e.g. phrase 90 (Hand washing Dimension)).

In this study to maintain the reliability of the observations, two observers, who were almost at the same level in terms of education, experience and knowledge, completed the checklists simultaneously and independently (Salimi et al., 2016). To avoid Hawthorne effects, before completing the checklists, these two observers were present several times in the wards to acquaint themselves with people and care providers, patients, equipment and environment, and to minimize the effect of their presence in maintaining patient safety by caregivers.

Completing each checklist took between 2 and 4 h, depending on the conditions of the section, and the entire sampling process lasted from early June to late December 2019. Data analysis was performed using SPSS-20 software and descriptive (percent, frequency, mean and standard deviation) and inferential (Fisher's exact test, T-test, ANOVA) statistics with a significance level of 0.05.

#### 4.2 | Instrument

For data collection, a "Checklist of patient safety principles" was used including nine dimensions of patients' safety and 95 items. The nine dimensions include similar and high-alert medications (with 16 items), drug accuracy in the service delivery process (with 16 items), correct identification of a patient (with 11 items), effective communication at the time of patient transfer (with 9 items), correct procedures (with 12 items), hand washing (with 7 items), use of disposable devices (with 14 items), avoidance of incorrect connections of catheters and tubes (with 8 items), and maintenance and control of the concentration of electrolyte solutions (with 3 items). This instrument is researcher-made and has been developed according to the instructions of the Ministry of Health and Medical Education for accreditation of hospitals<sup>1</sup> and based on the "checklist of patient safety principles" approved in Shahid Beheshti University of Medical Sciences.<sup>2</sup> In addition, previously scientific research articles nationally and internationally, reference books on nursing management, opinion polls and interviews with experts and professionals on patient accreditation and safety were included. This checklist in terms of evaluation criteria includes the following three options:

- Yes (having a score of 2, when the patient was completely safe with the desired action).
- Somewhat (having a score of 1, when the patient's safety was not maintained properly and completely with the desired action).
- No (having a score of zero, when the patient's safety was not maintained by the desired action).

Thus, the score for dimensions one to nine, respectively, was as follows: (32-0), (32-0), (22-0), (18-0), (24-0), (14-0), (26-0), (16-0)

and (6–0) and the total score of the checklist was calculated between 0 and 190 (Salimi et al., 2016).

Face and quantitative content validity were used to assess the validity of the checklist. Nine experts (four members of the faculty of the School of Nursing and Midwifery, three experts in the field of accreditation and two experts in the field of patient safety) were used to determine the content validity ratio.

By obtaining a number greater than the number of Lawshe Table (0.78), the item in each section of the checklist (the significance level of 0.05) was maintained; to determine the content validity index, a minimum of 80% was considered. The inter-rater coefficient calculation method was used, and the checklist was provided to the second observer who was similar to the researcher in terms of accuracy, skill, knowledge and awareness. Two observers completed the checklist for 15 observations related to patient safety at the same time, and then between the scores, the Inter-rater Coefficient with the Two-Way Mixed model was equal to 0.82, with a confidence of 0.95.

### 4.3 | Ethical considerations

Ethics approval was obtained from the Ethics Committee in Biomedical Research of Shahid Beheshti University of Medical Sciences, Shahid Beheshti University of Medical Sciences in Tehran (IR.SBMU.PHARMACY.REC.1397.1342). To collect data, the researchers obtained permission from the Vice Chancellor for Research of Shahid Beheshti University of Medical Sciences and Tehran University of Medical Sciences and referring to the teaching hospitals under the auspices of each University. Permission from key personnel on the hospitals (the head and director of the hospital) was also obtained and they were assured that the information collected would be confidential.

## 5 | RESULTS

In this study, which was conducted to compare the observance of patient safety principles, 71 ICUs including 14 NICUs, 4 PICUs, and 53 adult ICUs from teaching hospitals affiliated to two medical universities in Tehran were examined (Table 1).

Considering that in measuring the observance of patient safety principles, 9 dimensions were examined based on the “checklist of patient safety principles”, the degree of observance of these principles in each dimension was evaluated. This evaluation criterion

includes three options of “no”, “somewhat” and “yes”. The results showed that only in “Monitoring of correct procedure at the correct location” and “Maintenance and control of the concentration of electrolyte solutions” dimensions, there is a significant difference between the two universities (Table 2).

The average score obtained in each dimension was determined and then the calculated averages were compared between the hospitals of the two universities A and B. Due to the normality of the data, the independent t-test was used. The results showed that there was no significant difference between the two hospitals in terms of the total mean obtained ( $p$ -value = .15) and only in some dimensions, the difference in mean scores was statistically significant (Table 3).

The results showed that between the three neonatal, paediatric and adult ICUs, based on the evaluation criteria and using Fisher's exact test, there was no difference between the hospitals of the two universities in each dimension and it did not exist at all, and the two universities had similar conditions ( $p$ -value = .41).

Finally, the mean scores obtained in each dimension and each of the neonatal, paediatric, and adult ICUs were evaluated and compared using one-way analysis of variance. The results showed that only in dimension No.3 (effective communication at the time of patient transfer) the difference between the mean mentioned in the intensive care unit was significant ( $F [68,2] = 5.20$ ,  $p$ -value = .008) (Table 4). In order to follow up the mentioned difference and due to the unequal volume of these wards, Scheffe's post hoc test was used. The results showed that the mean obtained in this dimension in the paediatric intensive care unit ( $18.50 \pm 2.08$ ) was significantly higher than the mean of the same dimension in the adult intensive care unit ( $16.13 \pm 1.8$ ) ( $p$ -value = .04), but it did not differ from the mean in the neonatal intensive care unit ( $17.28 \pm 1.27$ ) ( $p$ -value = .48).

## 6 | DISCUSSION

This study aimed to assess patient safety based on a nine-dimensional “patient safety principles checklist” in neonatal, paediatric and adult intensive care units and between ICUs of hospitals affiliated to the two universities of medical sciences in Tehran.

The results showed that there are significant differences in the dimensions of “monitoring the correct procedure in the right place”, “how to maintain and control the concentration of electrolyte solutions”, “avoiding incorrect connections of catheters and tubes” and “hand washing”, when comparing and complying with the

| University | Intensive care unit |                     |                | Total<br>N (%) |
|------------|---------------------|---------------------|----------------|----------------|
|            | Neonate<br>N (%)    | Paediatric<br>N (%) | Adult<br>N (%) |                |
| A          | 8 (20.51)           | 2 (5.13)            | 29 (74.36)     | 39 (54.93)     |
| B          | 6 (18.75)           | 2 (6.25)            | 24 (75)        | 32 (45.07)     |
| Total      | 14 (19.72)          | 4 (5.63)            | 53 (74.65)     |                |

TABLE 1 Frequency distribution of the intensive care units

TABLE 2 Comparison of frequency distribution and percentage of points obtained, in each of the dimensions of patient safety principles

| Dimensions  | University | Evaluation  |                   |              | Fisher's exact test | p value |
|---|------------|-------------|-------------------|--------------|---------------------|---------|
|   |            | No<br>N (%) | Somewhat<br>N (%) | Yes<br>N (%) |                     |         |
| 1 Similar and high-alert drugs  | A          | 0 (0)       | 27 (69.2)         | 12 (30.8)    | 1.93                | .16     |
|   | B          | 0 (0)       | 17 (53.1)         | 15 (46.9)    |                     |         |
| 2 Identification of a patient   | A          | 0 (0)       | 29 (74.4)         | 10 (25.6)    | 5.32                | .07     |
|   | B          | 4 (12.5)    | 22 (68.8)         | 6 (18.8)     |                     |         |
| 3 Effective communication at the time of patient transfer               | A          | 0 (0)       | 2 (5.1)           | 37 (94.4)    | 3.26                | 1.71    |
|   | B          | 0 (0)       | 6 (18.8)          | 26 (81.3)    |                     |         |
| 4 Monitoring of correct procedure at the correct location               | A          | 0 (0)       | 27 (69.2)         | 12 (30.8)    | 7.56                | .023*   |
|   | B          | 4 (12.5)    | 24 (75)           | 4 (12.5)     |                     |         |
| 5 Maintenance and control of the concentration of electrolyte solutions | A          | 0 (0)       | 4 (10.3)          | 35 (89.7)    | 12.03               | .001*   |
|   | B          | 0 (0)       | 15 (46.9)         | 17 (53.1)    |                     |         |
| 6 Avoidance of incorrect connections of catheters and tubes             | A          | 0 (0)       | 18 (46.2)         | 21 (53.8)    | 1.29                | .53     |
|   | B          | 1 (3.1)     | 23 (71.9)         | 8 (25)       |                     |         |
| 7 Use of disposable devices   | A          | 0 (0)       | 28 (71.8)         | 11 (28.2)    | 1.29                | .53     |
|   | B          | 1 (3.1)     | 20 (71.9)         | 8 (25)       |                     |         |
| 8 Hand washing  | A          | 0 (0)       | 1 (2.6)           | 38 (97.4)    | 1.87                | .39     |
|   | B          | 1 (3.1)     | 2 (6.3)           | 29 (90)      |                     |         |
| 9 Drug accuracy in the service delivery process                         | A          | 25 (64.1)   | 13 (33.3)         | 1 (2.6)      | 1.53                | .46     |
|   | B          | 19 (59.4)   | 10 (31.3)         | 3 (9.4)      |                     |         |

\*The level of significance is 0.05.

measures taken with the patient safety principles in the ICUs of two universities.

The result of comparing the principles of patient safety in nurses working in ICUs affiliated to University B shows the inappropriate performance of these nurses in the "Monitoring of correct procedure at the correct location" dimension. While this dimension is very important, especially in the field of medication administration (Shahrokh, Ebrahimpour, & Ghodousi, 2013; Truter et al., 2017), surgery (Kim et al., 2015) and medical imaging and radiology (Zhou, Boyd, & Lawson, 2015). In a study of nurses' performance, it was found that there was often no proper performance of taking drugs in the right route, which could threaten the patient's safety. (Mirzaei et al., 2013) and in a systematic review in the intensive care unit, the most common side effects of non-observance of patient safety principles were classified into four areas, the first area of which was the use of incorrect sites during the injection. In the same study, other procedures such as incorrect intravascular catheterization and infusion of subcutaneous fluid and skin lesions were reported (Lanzillotti et al., 2015). Also, the results of another study examining safety standards were the unfavourable performance of nurses in this dimension (H Bayatmanesh et al., 2017). While another study considered the use of new nursing knowledge to correctly perform care procedures, it was very important and all participants in the study emphasized that their knowledge was effective in

assessing and recognizing the situation and performing the right skills (Apostolopoulou et al., 2014). The empowerment and acquisition of practical skills and the emphasis on performing proper procedures in accordance with existing instructions are some of the most important pillars of patient safety, because complications of incorrect procedures have led to prolonged hospital stays and serious injuries that are often life-long.

Based on the results, the dimension of "how to maintain and control the concentration of electrolyte solutions", in ICUs affiliated to University A was more in line with safety standards. This dimension examines care such as dilution and how to calculate medication dose, drug interactions, maintenance, taking necessary measures for drugs that require special attention and other pharmacological considerations.

A study showed that nurses often do not practice in accordance with the principles of patient safety including medication dose calculation, injection speed, drug dilution, mixing multiple medicines without considering drug interactions and safe medication administration of medication that require particular attention (Mirzaei et al., 2013). In a similar study conducted in NICUs, medication calculations and injection speed were items that endangered the patient's safety (Ramazani, Hosseini Almadvari, Fallahzadeh, & Dehghani Tafti, 2017). Also in the ICUs the most common complication due to patient safety principles was medication errors, which

TABLE 3 Comparison of the mean obtained in each of the dimensions to evaluate the principles of patient safety

| Dimensions  | University | Mean (SD**)    | Scores range | T statistics | p value |
|---|------------|----------------|--------------|--------------|---------|
| 1 Similar and high-alert drugs  | A          | 22.33 ± 2.33   | 0–32         | 0.68         | .50     |
|   | B          | 22.87 ± 3.96   |              |              |         |
| 2 Identification of a patient   | A          | 21.84 ± 2.50   | 0–32         | -1.41        | .17     |
|   | B          | 20.43 ± 5.18   |              |              |         |
| 3 Effective communication at the time of patient transfer               | A          | 16.33 ± 1.30   | 0–22         | -0.76        | .45     |
|   | B          | 16.69 ± 2.36   |              |              |         |
| 4 Monitoring of correct procedure at the correct location               | A          | 11.66 ± 1.47   | 0–18         | -3.67        | .01*    |
|   | B          | 9.59 ± 2.90    |              |              |         |
| 5 Maintenance and control of the concentration of electrolyte solutions | A          | 18.36 ± 1.48   | 0–24         | -3.11        | .03*    |
|   | B          | 16.31 ± 3.46   |              |              |         |
| 6 Avoidance of incorrect connections of catheters and tubes             | A          | 10.74 ± 1.23   | 0–14         | -2.38        | .02*    |
|   | B          | 9.75 ± 2.07    |              |              |         |
| 7 Use of disposable devices   | A          | 16.47 ± 3.70   | 0–28         | -0.90        | .37     |
|   | B          | 17.13 ± 2.39   |              |              |         |
| 8 Hand washing  | A          | 12.33 ± 1.05   | 0–16         | 2.94         | .05*    |
|   | B          | 13.72 ± 2.49   |              |              |         |
| 9 Drug accuracy in the service delivery process                         | A          | 2.51 ± 0.97    | 0–6          | -0.67        | .50     |
|   | B          | 2.31 ± 1.45    |              |              |         |
| Total   | A          | 133.26 ± 9.14  | 0–190        | -146         | .15     |
|   | B          | 128.16 ± 18.01 |              |              |         |

\*The level of significance is 0.05.

\*\*SD = Standard deviation.

| Dimension no.3 | Sum of squares | Df** | Mean square | F statistic | p value |
|----------------|----------------|------|-------------|-------------|---------|
| Between Groups | 31.81          | 2    | 15.91       | 5.20        | .008*** |
| Within Groups  | 207.94         | 68   | 3.06        |             |         |
| Total          | 239.75         | 70   |             |             |         |

\*Effective communication at the time of patient transfer.

\*\*Degrees of freedom.

\*\*\*The level of significance is 0.05.

include an inappropriate dose of the medication and incorrect application of medication therapy (Lanzillotti et al., 2015). This is while medication takes up more than 40% of the nurses' time in the work shift (Aboshaiqah, 2013). In ICUs, prescribing high-risk drugs and electrolyte solutions is common, which can cause irreparable physical damage and even death if the slightest negligence or inattention to special considerations related to the storage and administration of these drugs. Therefore, this dimension is one of the most important principles of patient safety, which has been neglected in the performance of nurses working in ICUs affiliated to University B.

"Avoiding catheter and tubing miss-connections" is another dimension that has received more attention in the ICUs of University A. In one study, this dimension among nurses was reported to be dissatisfied (H Bayatmanesh et al., 2017). Consistent

TABLE 4 The difference between the mean of dimension no.3\* in patient safety principles in neonatal, paediatric and adult intensive care unit

with this result, the results of the review study conducted in the ICUs are related to mechanical ventilation and its incorrect connections and improper removal of the endotracheal tube and its unwanted complications and sudden exit of the endotracheal tube (Lanzillotti et al., 2015). In ICUs, due to the changing conditions of patients and to provide specialized care such as respiratory support and monitoring of water and electrolyte status in patients, care devices such as tubes and catheters are used. Lack of familiarity with these devices or lack of attention to such connections leads to destructive and irreparable complications. Nurses must acquire the necessary ability to use these devices in practice before entering the ICUs and accepting the serious responsibility of caring for special patients. Because of the need for efficient and effective nursing care tools and the need to improve the quality



of nursing care, the healthcare system is obliged to organize and train professionals who can provide appropriate care for patients with a safety focus.

The nurses of both universities performed differently in the "hand washing" dimension, so that the nurses of the university B paid more attention to hand washing. A study in India attributed the high prevalence of nosocomial infections to poor hand hygiene, which has led to increased mortality and health care costs among hospitalized patients (Angel, 2015). Hand hygiene is a very easy way to reduce nosocomial infections and increase patient safety (Yaghubi, Sharifi, & Abbaspour, 2014). At the same time, however, its observance is at a low and undesirable level (Mertz et al., 2011). The results of another study that examined the knowledge and practice of medical staff about hand hygiene behaviour showed that although most of them were aware of proper handwashing and its necessity, only 36.6% before performing aseptic procedures washed their hands, and a very small percentage always maintained good hand hygiene before and after contact with the patient, and most staff performed poor overall handwashing and hygiene performance (Jemal, 2018). Specialized care in ICUs, such as respiratory support, fluid correction and electrolyte balance, as well as the need for care equipment, are needed due to patients' conditions. Although nurses are aware of their key role in the control of infections and the importance of handwashing as a first step in the prevention of nosocomial infections, they are not performing well in this area, which is a serious threat to patient safety. Given the sensitivities in the intensive care units and the vulnerability of patients, it is necessary for infection control supervisors to take measures to emphasize the importance of hand hygiene and encourage staff to follow health protocols.

Also, based on the results of this study, nurses in paediatric and neonatal intensive care units compared to nurses working in adult intensive care units, at the change of shift or patient transfer to other wards ("Effective communication in Patient delivery time" dimension), had a more effective relationship. Changing shifts and bedside handover help maintain patient safety. Because important information for accurate patient identification and clinical information on health status and treatment measures is shared more precisely between nurses and nothing is missed.

In addition, one of the important factors that promote patient safety is the proper communication of caregiver team members with the patient (M. Ridelberg et al., 2020a, 2020b). Reporting shifts on the bed of conscious adult patients familiarizes them with the purpose of the care program (Ofori-Atta, Binienda, & Chalupka, 2015). Awareness of the patient leads to better acceptance of the care plan by him and, in turn, facilitates the treatment process. The informed patient, as a member of the team along with the nurses, can participate in the care, and this awareness reduces the anxiety of the patient and his family and consequently leads to satisfaction. There is also the view that reviewing information about a patient's medical history or record, before shifting or during shifts, helps maintain patient safety in intensive care units (Gonçalves, Rocha, Anders, Kusahara, & Tomazoni, 2016).

Establishing effective communication when changing shifts or transferring patients, which ensures safety, should be considered as one of the components of nursing competence. For this purpose, with the direct support of management, it is necessary to properly implement the protocol on shift reporting and to provide the necessary ground to strengthen the communication skills of nurses during work. In a study conducted in adult ICUs, a dimension similar to the present study was patient admission and initial evaluation in which nurses' performance was assessed weak (H Bayatmanesh et al., 2017). A complete patient evaluation requires sufficient knowledge and skills of the nurse. Patient health status assessment is performed as a systematic analytical process for decision making and care planning (Perry, Potter, & Ostendorf, 2019) and the nurse as a key member of the care team with the correct knowledge and professional performance plays an effective role (Babaie, Hosseini, Hamissi, & Hamissi, 2015). In other words, from a patient safety perspective, the main purpose of effective communication at the time of patient delivery or shift reporting is to convey essential patient care information, continuity of care to achieve therapeutic goals, and ensuring safe care is provided by a competent nurse. Heads of these departments can provide arrangements such as in-department training to staff in accordance with the checklist. The performance of nurses should be monitored by the person in charge of patient safety in the ward, and the necessary feedback should be given to the staff in order to overcome the patient safety standards by providing principled care.

## 7 | LIMITATIONS

There are limitations to this study. While maintaining the reliability of the observations, the whole sampling was performed by two fixed persons, the effect of the presence of observers on the process of activity observed between nurses cannot be ignored, since the optimal performance of the nurse may be due to the presence of the observer or, conversely, due to stress, may not function properly. Also, in this study, considering that only the current situation was considered and this study aimed was to assess patient safety based on a nine-dimensional "patient safety principles checklist", so variables such as nurses' work experience and duration of employment in intensive care units, hours weekly work, the status of work shifts (fixed-in-circulation), workload and number of manpower employed in the ward in relation to the number of beds compared to the existing standard, level of education, amount of errors reported during at least the last 12 months in the ward and also, the opinion of the personnel about the safety status of the ward as well as the organizational factors related to the patient's safety issues have not been examined and as a result, the relationship between such variables and the patient's safety has not been measured. Therefore, it is suggested that, in future studies, the relationship between these variables and the safety performance of nurses should be examined in accordance with the principles of patient safety and its extent in all wards.

## 8 | IMPLICATIONS

The results of the study showed that nurses at the AICUs were weak in some basic skills. For example, they did not have good communication skills during patient transfer. Because the continuation of appropriate treatment is based on the correct transfer of information, weakness in this nursing skill will severely threaten the patient's safety. Therefore, managerial planning is necessary to empower nurses in this regard, which ultimately improves patient safety, and the implication of this finding can practically reduce the incidence of errors in medical settings.

## 9 | CONCLUSIONS

There is no significant difference in the level of observance of patient safety principles in two university-affiliated hospitals A and B, but since patient safety is an important priority in the health system, its study is very important and should be carefully considered in health care organizations.

### AUTHOR CONTRIBUTIONS

Contribution to conception and design of manuscript: Foroozan Atashzadeh-Shoorideh, Azam Shirinabadi Farahani. Acquisition of data: Foroozan Atashzadeh-Shoorideh, Azam Shirinabadi Farahani, Amir Hosein Pishgooie, Nazanin Hadi, Maryam Beheshti. Analysis and interpretation of data: Foroozan Atashzadeh-Shoorideh, Azam Shirinabadi Farahani, Amir Hosein Pishgooie. Contribution to drafting the manuscript: Foroozan Atashzadeh-Shoorideh, Azam Shirinabadi Farahani, Mohadese Babaie, Ensieh Fathollah Zadeh, Victoria Skerrett. Critical review of manuscript: Foroozan Atashzadeh-Shoorideh, Azam Shirinabadi Farahani

### ACKNOWLEDGEMENTS

This research is a project approved by Shahid Beheshti University of Medical Sciences and has the approval of the Ethics Committee in Biomedical Research of Shahid Beheshti University of Medical Sciences, under registry No. IR.SBMU.PHARMACY.REC.1397.1342. We would like to express our appreciation to the responsible authorities of the hospitals under study, as well as the nurses and other participants in the research.


### CONFLICT OF INTEREST

There is no conflict of interest.

### DATA AVAILABILITY STATEMENT

The data that support the finding of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

### ORCID

Foroozan Atashzadeh-Shoorideh  <https://orcid.org/0000-0002-6144-6001>

Azam Shirinabadi Farahani  <https://orcid.org/0000-0002-8929-7642>

### ENDNOTES

- [http://pe.iuums.ac.ir/IPPAppV1C081/PersianCPanel\\_WebUI/systemmanagement/login.aspx](http://pe.iuums.ac.ir/IPPAppV1C081/PersianCPanel_WebUI/systemmanagement/login.aspx)
- <http://treatment.sbm.u.ac.ir/index.jsp?pageid=25424&p=1>

### REFERENCES

- Aboshaiqah, A. E. (2013). Barriers in reporting medication administration errors as perceived by nurses in Saudi Arabia. *Middle-East Journal of Scientific Research*, 17(2), 130–136.
- Alves, D., Guirardello, E. B. (2016). Nursing work environment, patient safety and quality of care in pediatric hospital. *Revista Gaucha De Enfermagem*, 37(2), e58817. <https://doi.org/10.1590/1983-1447.2016.02.58817>
- Angel, R. (2015). Knowledge and practice regarding hand hygiene among HealthCare professional staffs in area hospital Suryapet, Telugana India. *International Journal of Social Sciences Arts and Humanities*, 3(1), 1–5.
- Apostolopoulou, E., Tselebis, A., Terzis, K., Kamarinou, E., Lambropoulos, I., & Kalliakmanis, A. (2014). Pressure ulcer incidence and risk factors in ventilated intensive care patients. *Health Science Journal*, 8(3), 333.
- Babaie, M., Hosseini, M., Hamissi, J., & Hamissi, Z. (2015). Knowledge, attitude and practice of nurses regarding organ donation. *Global Journal of Health Science*, 7(6), 129–137.
- Bartman, T., Bertoni, C. B., Merandi, J., Brady, M., & Bode, R. S. (2019). Patient safety: What is working and why? *Current Treatment Options in Pediatrics*, 5(2), 131–144.
- Bayatmanesh, H., Zagheri Tafreshi, M., Manoochehri, H., & Akbarzadeh Baghban, A. (2019). Patient safety observation by nurses working in the intensive care units of selected hospitals affiliated to Yasuj University of Medical Sciences. *ISMJ*, 21(6), 493–506.
- Bayatmanesh, H., Zagheri Tafreshi, M., Mnoochehri, H., & Akbarzadeh Baghban, A. (2017). Evaluation of patient-related nursing care with standards in intensive care unit (ICU). *Armaghane danesh*, 22(3), 375–389.
- Brunsveld-Reinders, A. H., Arbous, M. S., De Vos, R., & De Jonge, E. (2016). Incident and error reporting systems in intensive care: a systematic review of the literature. *International Journal for Quality in Health Care*, 28(1), 2–13.
- Dehghani, K., Nasiriani, K., & Mousavi, T. (2014). Investigating intensive care unit nurses' performance and its adjusting with standard. *SSU Journals*, 21(6), 808–815.
- Donaldson, M. S., Corrigan, J. M., & Kohn, L. T. (2000). *To err is human: Building a safer health system* (Vol. (Vol. 6)). National Academies Press.
- George, J. (2017). Medical morbidity and mortality conferences: Past, present and future. *Postgraduate Medical Journal*, 93(1097), 148–152.
- Gonçalves, M. I., Rocha, P. K., Anders, J. C., Kusahara, D. M., & Tomazoni, A. (2016). Communication and patient safety in the change-of-shift nursing report in neonatal intensive care units. *Texto & Contexto - Enfermagem*, 25(1), e2310014.
- Gordo, F., & Abella, A. (2014). Intensive care unit without walls: Seeking patient safety by improving the efficiency of the system. *Medicina Intensiva*, 38(7), 438–443.
- Guise, J.-M., Hansen, M., O'Brien, K., Dickinson, C., Meckler, G., Engle, P., Lambert, W., & Jui, J. (2017). Emergency medical services responders' perceptions of the effect of stress and anxiety on patient safety in the out-of-hospital emergency care of children: a qualitative study. *BMJ Open*, 7(2), e014057.



- Hemmat, F., Atashzadeh-Shoorideh, F., Mehrabi, T., & Zayeri, F. (2015). A survey of nurses' awareness of patient safety culture in neonatal intensive care units. *Iranian Journal of Nursing and Midwifery Research*, 20(4), 490–495.
- Hospital accreditation system. (2019). from [http://pe.iums.ac.ir/IPPAP/pV1C081/PersianCPanel\\_WebUI/systemmanagment/login.aspx](http://pe.iums.ac.ir/IPPAP/pV1C081/PersianCPanel_WebUI/systemmanagment/login.aspx)
- Ismail, B. M., & Nasir, M. (2017). Patient safety and its components. *Journal of Patient Safety & Quality Improvement*, 5(4), 592–593.
- Jemal, S. (2018). Knowledge and practices of hand washing among health professionals in Dubti referral hospital, Dubti, Afar, Northeast Ethiopia. *Advances in preventive medicine*, 2018, 1–7.
- Jha, A., Prasopa-Plaizier, N., Larizgoitia, I., & Bates, D. W. (2010). Patient safety research: An overview of the global evidence. *BMJ Quality & Safety*, 19(1), 42–47.
- Kalrooz, F., & Joolae, S. (2018). Safety in pediatric intensive care units in Iran: An integrative review. *Iran Journal of Nursing*, 31(112), 6–19.
- Karlsen, M. M. W., Ølnes, M. A., & Heyn, L. G. (2019). Communication with patients in intensive care units: a scoping review. *Nursing in Critical Care*, 24(3), 115–131.
- Kim, F. J., da Silva, R. D., Gustafson, D., Nogueira, L., Harlin, T., & Paul, D. L. (2015). Current issues in patient safety in surgery: a review. *Patient Safety in Surgery*, 9(1), 26.
- Lake, E. T., Germack, H. D., & Viscardi, M. K. (2016). Missed nursing care is linked to patient satisfaction: a cross-sectional study of US hospitals. *BMJ Quality & Safety*, 25(7), 535–543.
- da Silva Lanzillotti, L., De Seta, M. H., de Andrade, C. L. T., & Mendes Junior, W. V. (2015). Adverse events and other incidents in neonatal intensive care units. *Ciencia & saude coletiva*, 20, 937–946.
- Lotfi, Z., Atashzadeh-Shoorideh, F., Mohtashami, J., & Nasiri, M. (2018). Relationship between ethical leadership and organisational commitment of nurses with perception of patient safety culture. *Journal of Nursing Management*, 26(6), 726–734.
- MacFie, C. C., Boudouin, S. V., & Messer, P. B. (2016). An integrative review of drug errors in critical care. *Journal of the Intensive Care Society*, 17(1), 63–72.
- Mertz, D., Johnstone, J., Krueger, P., Brazil, K., Walter, S. D., & Loeb, M. (2011). Adherence to hand hygiene and risk factors for poor adherence in 13 Ontario acute care hospitals. *American Journal of Infection Control*, 39(8), 693–696.
- Miladinia, M., Zarea, K., Baraz, S., Mousavi, N. E., Pishgooie, A. H., & Gholamzadeh, B. M. (2016). Pediatric Nurses' medication error: The self-reporting of frequency. *Types and Causes*, 3(4), 1439–1444.
- Mirzaei, M., Khatony, A., Faramani, R. S., & Sepahvand, E. (2013). Prevalence, types of medication errors and barriers to reporting errors by nurses in an educational Hospital in Kermanshah. *HAYAT*, 19(3), 28–37.
- Nasrabadi, T., Shirinabadi Farahani, A., Rassouli, M., Zagheri Tafreshi, M., Chaibakhsh, S., & Usefinezhad, Z. (2019). Estimation of working hours of nursing staff in neonatal intensive care units: A work sampling. *Iranian Journal of Neonatology IJN*, 10(1), 35–41.
- Ofori-Atta, J., Binienda, M., & Chalupka, S. (2015). Bedside shift report: Implications for patient safety and quality of care. *Nursing*, 45(8), 1–4. <https://doi.org/10.1097/01.NURSE.0000469252.96846.1a>
- Perry, A. G., Potter, P. A., & Ostendorf, W. (2019). *Nursing Interventions & Clinical Skills E-book: Elsevier health sciences*. Elsevier.
- Ramazani, T., Hosseini Almadvari, S., Fallahzadeh, H., & Dehghani Tafti, A. (2017). Type and rate of medication errors and their causes from the perspectives of neonatal and neonatal intensive care units nurses in Yazd hospitals, 2014. *Community Health journal*, 10(1), 63–71.
- Ramos, R. R., & Caligid, C. C. (2018). Patient safety culture among nurses at a tertiary government hospital in The Philippines. *Applied Nursing Research*, 44, 67–75.
- Ridelberg, M., Roback, K., & Nilsen, P. (2020a). How can safer care be achieved? Patient safety Officers' perceptions of factors influencing patient safety in Sweden. *Journal of Patient Safety*, 16(2), 155–161. <https://doi.org/10.1097/pts.0000000000000262>
- Ridelberg, M., Roback, K., & Nilsen, P. (2020b). How can safer care be achieved? Patient safety Officers' perceptions of factors influencing patient safety in Sweden. *Journal of Patient Safety*, 16(2), 155–161.
- Salimi, M., Masoumpoor, A., Shirinabadi Farahani, A., Shakeri, N., Alaei Karharoudy, F., & Shiri, H. (2016). Auditing nursing care related to weaning neonates from mechanical ventilation in neonatal intensive care units. *HAYAT*, 22(2), 159–174.
- Shahrokhi, A., Ebrahimpour, F., & Ghodousi, A. (2013). Factors effective on medication errors: A nursing view. *Journal of research in pharmacy practice*, 2(1), 18–23.
- Stocker, M., Pilgrim, S. B., Burmester, M., Allen, M. L., & Gijsselaers, W. H. (2016). Interprofessional team management in pediatric critical care: Some challenges and possible solutions. *Journal of Multidisciplinary Healthcare*, 9, 47.
- Tahmazi Aghdam, A., Nafar, H., Aghaei Hashchin, A., Abbasi Chaleshtari, A., & Salehi, S. (2021). Patient safety culture assessment of a Hospital in Tehran: A case study. *Journal of Patient Safety & Quality Improvement*, 9(4), 225–234.
- Thomas, E. J., & Petersen, L. A. (2003). Measuring errors and adverse events in health care. *Journal of General Internal Medicine*, 18(1), 61–67.
- Truter, A., Schellack, N., & Meyer, J. C. (2017). Identifying medication errors in the neonatal intensive care unit and paediatric wards using a medication error checklist at a tertiary academic hospital in Gauteng, South Africa. *South African Journal of Child Health*, 11(1), 5–10.
- Wei, W., Niu, Y., & Ge, X. (2019). Core competencies for nurses in Chinese intensive care units: a cross-sectional study. *Nursing in Critical Care*, 24(5), 276–282.
- WHO. (2020). from [https://www.who.int/health-topics/patient-safety#tab=tab\\_1](https://www.who.int/health-topics/patient-safety#tab=tab_1)
- Wilcock, M., Harding, G., Moore, L., Nicholls, I., Powell, N., & Stratton, J. (2013). What do hospital staff in the UK think are the causes of penicillin medication errors? *International Journal of Clinical Pharmacy*, 35(1), 72–78.
- Yaghubi, M., Sharifi, S., & Abbaspour, H. (2014). Knowledge, attitude, and practice of intensive care units nurses about nosocomial infections control in hospitals of Bojnurd in 2012. *Journal of North Khorasan University of Medical Sciences*, 5(5), 943–950.
- Zhou, Y., Boyd, L., & Lawson, C. (2015). Errors in medical imaging and radiography practice: a systematic review. *Journal of medical imaging and radiation sciences*, 46(4), 435–441.

**How to cite this article:** Atashzadeh-Shoorideh, F., Shirinabadi Farahani, A., Pishgooie, A. H., Babaie, M., Hadi, N., Beheshti, M., Zadeh, E. F., & Skerrett, V. (2022). A comparative study of patient safety in the intensive care units. *Nursing Open*, 9, 2381–2389. <https://doi.org/10.1002/nop2.1252>