

## Comparison of the SBAR method and modified handover model on handover quality and nurse perception in the emergency department: a quasi-experimental study

Atefeh Alizadeh-risani<sup>1</sup>, Fatemeh Mohammadkhah<sup>2</sup>, Ali Pourhabib<sup>2</sup>, Zahra Fotokian<sup>2,4\*</sup> and Marziyeh Khatooni<sup>3</sup>

### Abstract

**Background** Effective information transfer during nursing shift handover is a crucial component of safe care in the emergency department (ED). Examining nursing handover models shows that they are frequently associated with errors. Disadvantages of the SBAR handover model include uncertainty of nursing staff regarding transfer of responsibility and non-confidentiality of patient information. To increase reliability of handover, written forms and templates can be used in addition to oral handover by the bedside.

**Aims** The purpose of this study is to compare the 'Situation, Background, Assessment, Recommendation (SBAR) method and modified handover model on the handover quality and nurse perception of shift handover in the ED.

**Methods** This research was designed as a semi-experimental study, with census survey method used for sampling. In order to collect data, Nurse Perception of Handover Questionnaire (NPHQ) and Handover Quality Rating Tool (HQRT) were used after translating and confirming validity and reliability used to direct/collect data. A total of 31 nurses working in the ED received training on the modified shift handover model in a one-hour theory session and three hands-on bedside training sessions. This model was implemented by the nurses for one month. Data was analyzed with SPSS (version 26) using paired t-tests and analysis of covariance.

**Results** Results indicated significant difference between the modified handover model and SBAR in components of information transfer ( $P < 0.001$ ), shared understanding ( $P < 0.001$ ), working atmosphere ( $P = 0.004$ ), handover quality ( $P < 0.001$ ), and nurse perception of handover ( $P < 0.001$ ). The univariate covariance test did not show demographic variables to be significantly correlated with handover perception or handover quality in SBAR and modified methods ( $P > 0.05$ ).

**Conclusions** The results of this study can be presented to nursing managers as a guide in improving the quality of nursing care via implementing and applying the modified handover model in the nursing handover. The resistance

\*Correspondence:

Zahra Fotokian

Full list of author information is available at the end of the article

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of nurses against executing a new handover method was one of the limitations of the research, which was resolved by explanation of the plan and goals, as well as the cooperation of the hospital matron, and the ward supervisor. It is suggested to carry out a similar investigation in other hospital departments and contrast the outcomes with those obtained in the current study.

**Keywords** SBAR method, Modified handover model, Emergency department, Nursing perception, Patient safety



## Introduction

One of the professional responsibilities of nurses in delivering high-quality and safe nursing care is the handover process [1]. This concept refers to the process of transferring the responsibility of care and patient information from one caregiver to another, in order to continue the care of the patient [2]. Effective information transfer during nursing shift handover is considered a vital component of safe care in the Emergency Department (ED). Some challenges in providing accurate information during handover include providing excessive or insufficient information, lack of a checklist, and delays in handover [3]. Incomplete transmission of information increases the occurrence of errors, leads to inappropriate treatment, delays diagnosis and treatment, and increases physician and nursing errors and treatment costs [4]. A study by Spooner showed that 80% of serious medical care errors are related to nursing handovers, and one fifth of patients suffer from complications due to handover errors [5]. A review of 3000 sentinel events demonstrated that a communication breakdown occurred 65–70% of the time. It has been demonstrated that poor communication handovers result in adverse events, delays in treatment, redundancies that impact efficiencies and effectiveness, low patient and healthcare provider satisfaction, and more admissions [3].

There are various nursing handover methods, including oral handover, and the use of special forms [6]. The oral handover method at the bedside can lead to better communication, improved patient care, and increased patient satisfaction [7]. So far, several shift handover tools have been developed in hospital departments, including: ISOBAR [8], ISBAR [9], SBAR [3], REED [10], ICCCO [11], VITAL and PVITAL [12] and the modified nursing handover model [13]. Examining nursing handover models shows that they are frequently associated with errors [14]. While a format to use for a handover was the topic of study in several of the nursing studies [15–18], accuracy of content and outcomes were not included. Barriers and facilitators to nursing handovers were identified, but evidence for best practice was not evident. Various strategies have been developed to enhance the effectiveness and efficiency of nursing handover, including standardized approaches, bedside handover and technology. The majority of these models have been evaluated in inpatient settings; few have been conducted in the ED. Among these shift handover models, the PVITAL model was specifically designed for the ED and includes

components of Present patient, Intake and output, Treatment and diagnosis, Admission and discharge, and Legal and documentation. Despite the positive aspects, this model has inconsistencies that question its effectiveness in nursing shift handovers [13]. Also, one of the most widely used shift handover is the SBAR model [19]. The SBAR model includes Situation, Background, Assessment, and Recommendation components. SBAR is an information tool that transmits standardized information and makes reports concise, targeted and relevant, and facilitates information exchanges, and can be improved by involving the patient in delivery and transformation [20]. The SBAR handover model was proposed by the joint commission with the aim of reducing errors and increasing the quality of care. This model was initially designed by Leonard and Graham for use in health care systems [3]. In 2013, adoption of this model for nursing handovers was announced mandatory by the Deputy Minister of Nursing of Iran Ministry of Health [21]. Currently, this model is only implemented orally at the patient bedside [22]. Disadvantages of this model include uncertainty of nursing staff regarding transfer of responsibility and nonconfidentiality of patient information. To increase reliability of handover, written forms and templates can be used in addition to oral and face-to-face handover by the bedside [23]. In this regard, the modified nursing handover model was first designed by Klim et al. (2013) for shift handover in the ED. This method has a written form and template and includes components of identification and alert, assessment and progress, nursing care need, plan, and alerting the nurse in charge/medical officer based on vital sign parameters or clinical deterioration [24]. Findings of a study by Kerr (2016) showed that implementation of this model improves transmission of important information to nurses in subsequent shifts, leading to an increase in participation of patients and their companions in the handover process [13].

The use of a simple, structured, and standard model with a written template in nursing handovers is one of the elements influencing provision of appropriate services. According to research, implementation of the modified handover model in Iran has not been investigated to date. Despite the widespread use of SBAR, there is limited comparative research on its effectiveness relative to modified handover models in emergency settings. We hypothesize that the modified model will result in fewer handover errors compared to the SBAR method. This study aims to compare the effectiveness of the SBAR method and modified handover model on handover quality and nurse perception in the ED.



## Materials and methods Design

This research was designed as a pre-post intervention, semi-experimental study, with census survey method used for sampling. **Participants**

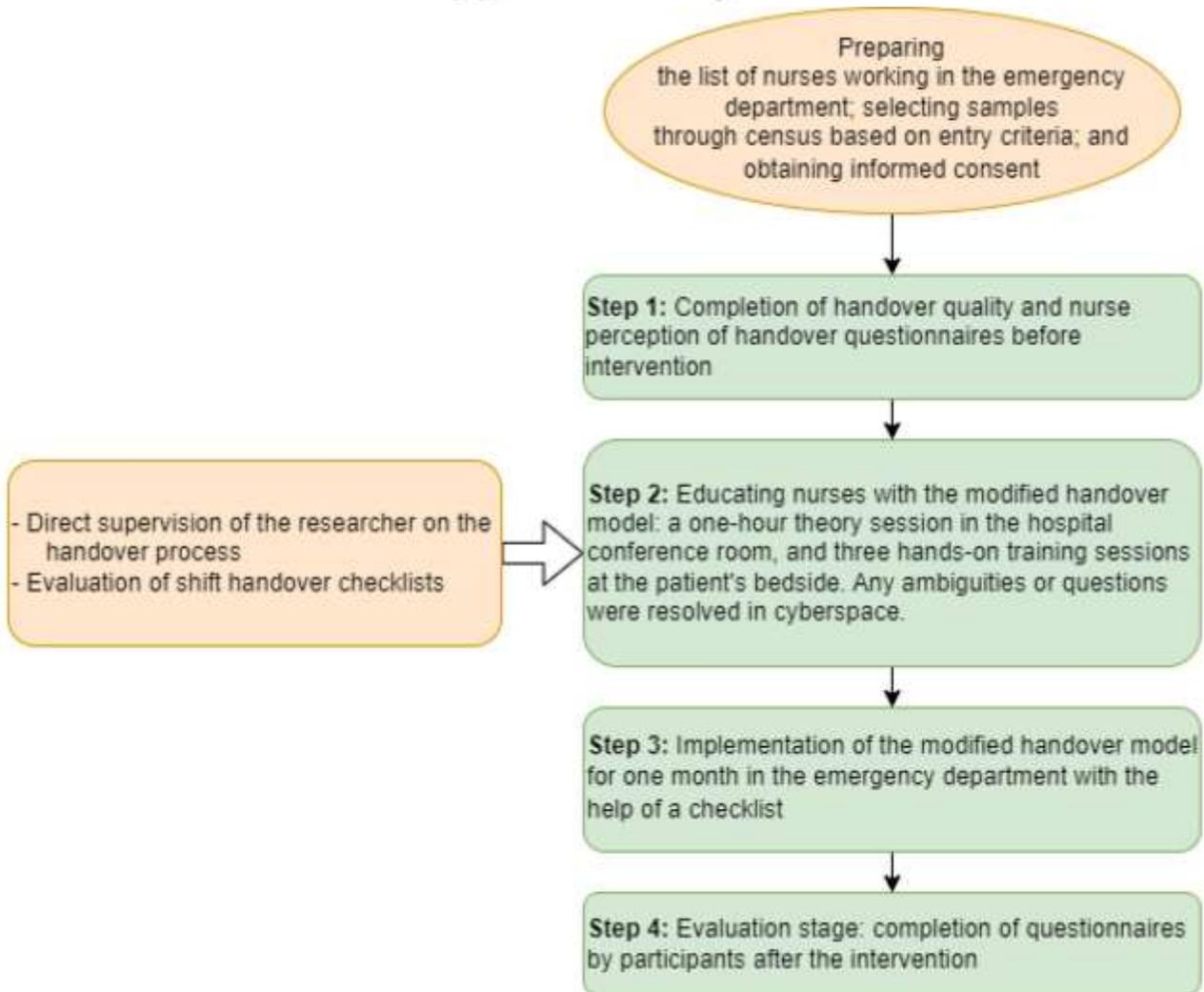
The study location was the ED of Zakaria Razi Social Security Hospital in Qazvin, Iran. The sample size was selected through a census of nurses working in the ED of Zakariya Razi Hospital in Qazvin. There were 45 nurses working in the emergency department, including 38 nurses, one head nurse, one assistant head nurse (staff), three triage nurses and two outpatient operating room nurses. Six nurses had less than six months of work experience in the ED and were not included in the study according to the inclusion criteria. Considering a Cohen's effect size of 0.52 (based on a pilot sample of the dependent variable, quality of shift handover), with a Type I error rate of 5% and a statistical power of test 80%, the sample size was estimated to be 32 individuals using GPOWER software. A total of 32 nurses were included in the study, but one nurse withdrew from participation, resulting in a final sample size of 31 nurses. The inclusion criteria comprised willingness to participate in the study, and at least 6 months of working experience in the ED. Unwillingness to continue cooperation was set as one of the exclusion criteria. **Data collection (procedures)**

Initially, the researcher made a list of the nurses employed in the ED. The nurses were then introduced to the study and its objectives, and participants were selected based on inclusion criteria and obtaining informed consent to participate in the study. The SBAR model was routinely implemented orally in the ED. At the beginning of the research, Nurse Perception of Hanover Questionnaire (NPHQ) and Handover Quality Rating Tool (HQRT) were completed by all participants. Owing to lack of familiarity with the modified handover model, nurses were educated via a one-hour theory session in the hospital conference hall, where the items of the modified nursing handover checklist and how to complete it were taught using PowerPoint and a whiteboard. Three hands-on training sessions was individually held for all nurses explaining the handover model, how to fill out the checklist and use the checklist during shift handover at the patient's bedside. In order to resolve ambiguities and questions, we communicated with the participants through cyberspace. Brainstorming, clear explanations, effective communication, and receiving feedback were used for more productive training sessions. Moreover, the modified handover checklist was designed by the researcher and provided to the nurses for better understanding of the contents. Subsequently, the modified handover model was implemented by the participants for one month [13].

During this month, about 350 shift handovers were made with the modified handover method. In order to ensure proper implementation, the researcher attended and directly supervised all handover situations involving the target group. After implementation of the modified handover model, NPHQ and HQRT were completed once more by the participants (Fig. 1).

## Instruments

1. **Demographic information:** included variables of age, gender, marital status, level of education, employment type, years of work experience, years of work experience in the ED, working conditions in terms of shifts.
2. **Nurse handover perception questionnaire (NHPQ):** This 22-item questionnaire reveals perception and performance of nurses regarding shift handover. The first half of the NHPQ examines perceptions regarding current practices and essential components of handover [15]. The second half of the NHPQ, reviews nurse views regarding bedside handover [23]. The items in the NHPQ questionnaire include a series of statements about nurses' general understanding of shift handover and their experiences of clinical shift handover at the bedside. This tool is scored on a 4-point Likert scale, with scores ranging from 22 to 88. A higher score indicates a higher perception of handover. Eight items of this questionnaire [3, 4, 8, 10, 17, 20, 21] are scored negatively. Content validity was reported using a content validity index (CVI) of 0.92, which indicated satisfactory content validity. The internal reliability of the questionnaire items was determined using Cronbach's alpha of 0.99. The one-dimensional Intraclass Correlation Coefficient (ICC) for the internal homogeneity test of the items was 0.92 [23].
3. **Handover quality rating tool (HQRT):** The handover quality rating tool has been developed to evaluate the shift handover quality. This 16-item questionnaire includes five components of information transfer (items 1 to 7), shared understanding (items 8 to 10), working atmosphere (items 11 to 13), handover quality (item 14), and circumstances of the handover (items 15 and 16). This questionnaire is scored on a 4-point Likert scale, with the scores ranging from 16 to 64. A higher



**Fig. 1** The process of implementing the modified nursing handover model

*Data collection*

score indicates better handover quality [24]. A study reported the validity of this tool with a reliability coefficient of 0.67 [25].

The above questionnaires have not been used in Iran to date. Therefore, they were translated and validated in the present study, as part of a master's thesis in internasurgical nursing [26]. The results related to the process of translating the questionnaires are summarized as follows:

1. Getting permission from the tool designer;
2. Translation from the reference language (English) to the target language (Persian): In this study, two translators familiar with English performed the translation from the original language to Persian. The

translation process was carried out independently by the two translators.

3. Consolidation and comparison of translations: At this stage, the researchers held a meeting to review the translated questionnaires in order to identify and eliminate inappropriate phrases or concepts in the translation. The original version and the translated versions were checked for any discrepancies. The translated versions were combined and a single version was developed.
4. Translation of the final translated version from the target language (Persian) to the original language (English): This translation was performed by two experts fluent in English. The translated versions were reviewed by the research team and discussed until a consensus was reached. Subsequently, the Persian questionnaires were distributed to ten faculty members to assess content validity, and to twenty nurses working in the ED to evaluate reliability. This process was conducted twice, with a gap of 10 days



between each administration. After making necessary corrections, the final version of the questionnaire was prepared. In the present study, all items of the NHPQ and HQRT had a CVI above 0.88, which is acceptable. SCVI/UA was 0.86 and 0.87 for NHPQ and HQRT respectively. SCVI/AVE of both questionnaires was 0.98, which is in the acceptable range. CVR of all items of both questionnaires was above 0.62. Cronbach's alpha coefficient was 0.93 for NHPQ and 0.96 for HQRT. Hence, the reliability of the tools was confirm [26].

#### Data analysis

Descriptive and inferential statistics were used for data analysis using SPSS software (version 24). Paired t-tests, chi-square and analysis of variance were used to compare the effect of SBAR and the modified handover models. *P* Value of < 0.05 was considered significant.

#### Results Nurse characteristics

The average age of the participants was  $33 \pm 4$  years. Seventeen (54.8%) were women, and 22 (71%) were married. Thirty (96.8%) had a bachelor's degree, and 23 (74.2%) were officially employed. Fourteen (45.2%) had a work experience of 6–10 years, while 16 (51.6%) had less than 5 years of work experience (Table 1).

According to paired t-test results, significant difference existed between the average handover quality of the SBAR model and the modified handover model ( $P < 0.001$ ). Accordingly, the average quality of handover in the modified handover model (57.64) was 8.09 units higher than the SBAR model (49.54). Also, based on paired t-test results, there was significant difference between the two

models in components of information transfer ( $P < 0.001$ ), shared understanding ( $P < 0.001$ ), working atmosphere ( $P = 0.004$ ), and handover quality ( $P < 0.001$ ). Meanwhile, the component of circumstances of the handover, was not significantly different between the two models ( $P = 0.227$ ). Therefore, our findings indicated that handover quality and its components (except circumstances of the handover) were higher in the modified handover model compared with the SBAR model. Findings from the analysis of Cohen's d effect size indicated that the modified handover model has a significantly greater influence on the quality of handover, being 1.29 times higher than the SBAR model. According to results, the modified handover model had the largest effect on the information transfer component with an effect size of 1.56 units, and the smallest effect on the circumstances of the handover with an effect size of 0.23 units (Table 2).

Results of the paired t-test revealed significant difference between the average nurse perception of handover in two models of SBAR and modified handover ( $P < 0.001$ ). The average nurse perception of handover was 9.64 units higher in the modified handover model (80.45) compared with the SBAR model (70.80). The results of Cohen's d effect size showed that the modified handover model is 1.51 times more effective than the SBAR model on nurses' perception of handover (Table 2).

The results of the paired t-test demonstrated that all items except "not enough time allowed", "there was a tension between the team", "the person handing over under pressure", and "the person receiving under pressure", were significantly different between the two models ( $P < 0.05$ ). Hence, comparing the two models according to Cohen's effect size, the largest and smallest effect sizes belonged to the items "use of available documentation (charts,

**Table 1** Demographic profile of emergency department nurses participating in the study Variable

|                 |                   | Frequency | Percentage (%) |
|-----------------|-------------------|-----------|----------------|
| Gender          | Female            | 17        | 54.8%          |
|                 | Male              | 14        | 45.3%          |
| Marital status  | Single            | 9         | 29%            |
|                 | Married           | 22        | 71%            |
| Education       | Bachelor's degree | 30        | 96.8%          |
|                 | Master's degree   | 1         | 3.3%           |
| Employment type | Contract          | 8         | 25.8%          |
|                 | Official          | 23        | 74.3%          |





- After handover, I seek additional information about patients from another nurse or the nurse in charge.
- I believe this shift handover model is time consuming.

According to calculated Cohen's effect sizes, the largest and smallest effect sizes of the modified handover model in comparison with the SBAR method belonged to "I receive sufficient information on nursing care (activity, nutrition, hydration, and pain) during the shift handover" (1.54) and "I believe this shift handover model is time consuming" (0.024), respectively (Table 4).

Univariate covariance analysis was used to determine the relationship of demographic variables with nurse perception of handover and the quality of handover. Due to a quantitative nature, the age variable was entered as a covariate and other variables as factors. The results revealed that demographic variables do not have a significant effect on nurses' perception of handover or the quality of handover in either of the two models ( $P > 0.05$ ).

## Discussion

The present study was conducted with the aim of comparing the effect of implementing SBAR and modified handover models on handover quality and nurse



**Table 4** Comparison of questions regarding perception of handover with SBAR and modified handover models in nurses working in the emergency department

| Number | Questions  | SBAR     | Modified | Mean       | P Value | Co-   |         |       |
|--------|--|----------|----------|------------|---------|-------|---------|-------|
|        | Effect   | handover | handover | Difference | hen's   | model |         |       |
|        |  |          |          |            | model   | model |         |       |
|        | Mean SD Mean SD Size   |          |          |            |         |       |         |       |
| 1      | I am provided with sufficient information about the patient under my care.   | 3.51     | 0.50     | 4          | 0.01    | -0.48 | < 0.001 | 0.953 |
| 2      | Shift handover information is presented in an orderly and organized manner.  | 3.45     | 0.56     | 4          | 0.01    | -0.54 | < 0.001 | 0.966 |
| 3      | I believe I am not receiving important information.  | 3.64     | 0.55     | 3.87       | 0.34    | -0.22 | 0.017   | 0.454 |
| 4      | Most of the information I receive during shift handover is not related to the patient under my care.   | 3.87     | 0.42     | 3.93       | 0.24    | -0.06 | 0.161   | 0.258 |
| 5      | Charts are available during handover to clarify the information provided.  | 3.09     | 0.65     | 3.87       | 0.42    | -0.77 | < 0.001 | 1.158 |
| 6      | During the handover, I use charts for medication, vital signs, allergies, and fluid balance to review patient nursing care.                        | 2.93     | 0.77     | 3.90       | 0.30    | -0.96 | < 0.001 | 1.472 |
| 7      | I find it easy to follow the information that is presented to me.  | 3        | 0.93     | 3.96       | 0.17    | -0.96 | < 0.001 | 1.061 |
| 8      | Noise interferes with my ability to concentrate during shift handover.   | 3.48     | 0.92     | 2.67       | 0.87    | -0.19 | 0.206   | 0.232 |
| 9      | I believe effective communication skills (such as clear and calm speech) should be used in handover.   | 3.80     | 0.60     | 4          | 0.01    | -0.19 | 0.083   | 0.322 |
| 10     | In my experience, shift handover is often disrupted by patients, companions or other staff.  | 2.22     | 0.84     | 2.35       | 0.91    | -0.12 | 0.103   | 0.302 |
| 11     | During shift handover, I receive up to date information about the patient.   | 3.54     | 0.56     | 3.93       | 0.24    | -0.38 | < 0.001 | 0.782 |
| 12     | After handover, I seek additional information about patients from another nurse or the nurse in charge.  | 3.16     | 0.68     | 2.96       | 0.91    | 0.19  | 0.161   | 0.258 |
| 13     | During handover, I have the opportunity to raise questions regarding ambiguities.  | 3.35     | 0.55     | 3.67       | 0.47    | -0.32 | 0.002   | 0.596 |
| 14     | I am asked to ask any questions regarding the information received.  | 3.41     | 0.56     | 3.87       | 0.34    | -0.45 | < 0.001 | 0.795 |
| 15     | I obtain a comprehensive perception of the patient plan (diagnosis, treatment, and discharge) as a consequence of handover.                        | 3.22     | 0.49     | 3.87       | 0.34    | -0.64 | < 0.001 | 1.326 |
| 16     | I receive sufficient information on nursing care (activity, nutrition, hydration, and pain) during the shift handover.                             | 3.22     | 0.42     | 3.93       | 0.24    | -0.70 | < 0.001 | 1.538 |
| 17     | According to my observations, important of vital sign indicators -BP, Spo2, etc. are generally left out of nursing handover.                       | 2.87     | 0.99     | 3.74       | 0.44    | -0.87 | < 0.001 | 0.945 |
| 18     | According to my observations, crucial details regarding medications (contraindications, sensitivity, etc.) are not often provided during handover. | 2.70     | 0.90     | 3.70       | 0.52    | -1    | < 0.001 | 1.118 |
| 19     | Using this shift handover model helps me improve my communication skills with my colleagues.   | 3.51     | 0.56     | 3.93       | 0.24    | -0.41 | < 0.001 | 0.743 |
| 20     | I believe that using this shift handover model increases the quality and safety of patient care.   | 3.51     | 0.50     | 4          | 0.001   | -0.48 | < 0.001 | 0.953 |
| 21     | I believe this shift handover model is time consuming.   | 3.09     | 0.87     | 3.12       | 0.92    | -0.03 | 0.893   | 0.024 |
| 22     | Use this model in shift handover is not convenient to me.  | 3.12     | 0.76     | 3.09       | 0.83    | 0.03  | 0.873   | 0.029 |

perception of handover in the ED. Based on our findings, implementation of the modified handover model has a more favorable effect on the average handover quality and nurse perception scores compared with the SBAR method. The modified handover model was first designed by Klim et al. (2013), by modifying the components of the SBAR model via group interviews in the ED (17). The modified handover model focused on a standardized approach, including checklists, with emphasis on nursing care and patient involvement. This handover model in the ED enhanced continuity of nursing care, and aspects of the way in which care was implemented and documented, which

might translate to reduced incidence of adverse events in this setting. Improvements observed in this current study, such as application of charts for medication, vital signs, allergies, and fluid balance to review patient nursing care, and receiving sufficient information on nursing care (activity, nutrition, hydration, and pain) during the shift handover might help prevent adverse events, including medication errors and promoted handover quality.

Another component of the new handover model was that handover should be conducted in the cubicle at the bedside and involve the patient and/or their companion. More



recently, it has been shown that family members also value the opportunity to participate in handover, which promotes family-centered care. Hence, there are disparate opinions between nurses, patients and their family about whether patients should participate in handover. Florin et al. suggest that nurses should establish patient preferences for the degree of their participation in care [27]. In a phenomenological study, Frank et al. found that ED patients want to be acknowledged; however, they struggle to become involved in their care. In this current study, handover was more likely to be conducted in front of the patient, and more patients had the opportunity to contribute to and/or listen to handover discussion after the introduction of the ED structured nursing handover framework [28].

Preliminary data showed that there was mixed opinion regarding the appropriate environment for inter-shift handover in the ED. The framework was specifically modified to address deficits in nursing care practice, effect on handover quality and nurse perception of handover. For example, emphasis was placed on viewing the patient's charts for medication, vital signs and fluid balance. This provides an opportunity for omissions of information, documentation, or care to be identified and addressed at the commencement of a shift. The results of a study by Kerr (2016) demonstrated that implementation of this model improves the transfer of important information to nurses of subsequent shifts and does not possess the shortcomings of the SBAR model [13].

Accordingly, implementing the modified handover model, improves bedside handover quality from 62.5 to 93%, patient participation in the handover process from 42.1 to 80%, information transfer from 26.9 to 67.8%, identification of patients with allergies from 51.2 to 82%, the amount of documentation from 82.6 to 94.1%, and the use of charts and documentation during handover from 38.7 to 60.8%, meanwhile decreasing omission of essential information such as vital signs from 50 to 32.2%. The authors concluded that implementation of the modified handover model increases documentation, improves nursing care, improves receiving information, enhances patient participation during handover, reduces errors in care and documentation, and promotes bedside handover. A good quality handover facilitates the transfer of information, mutual understanding, and a good working environment [13]. These findings are consistent with the results of current study.

Moreover, Beigmoradi (2019) showed that in the SBAR model, less attention is paid to clinical records and evaluation of patient body systems during the handover [29].

Patients are treated urgently in the ED, with the goal of a comprehensive handover immediately. Meanwhile, the non-comprehensive handover model causes a halt in the flow of information, which reduces the handover efficiency. In contrast, the results of a study by Li et al. (2022) demonstrated that implementing a combined model of SBAR and mental map, leads to a significant improvement in the quality of handover and nurse perception of the patient, while reducing defects in shift handover [30]. Kazemi et al. (2016) showed that patient participation in the handover process increases patient and nurse satisfaction and helps inform patients of their care plan [22].

According to our findings, demographic variables do not have a significant effect on nurses' perception of handover and the quality of handover in SBAR or modified handover models. The results of this study can be compared with the results of others in some aspects. Mamallalala et al. (2017) showed that there is significant difference between experience and information transfer of information during shift handover. Hence, nurses with an experience of more than 10 years show higher levels of shared communication and information transfer during shift handover [31]. The findings of the study by Zakrison et al. (2016) also demonstrated that more experienced nurses are more concerned about transferring information compared with the less experienced [32], which is not consistent with the results of the present study. The reason for this discrepancy may be the different characteristics of the study samples in the two studies.

## Conclusion

The findings of the present study demonstrated that the modified handover model demonstrably improves Shift handover quality, Information transfer, Shared understanding and Perception of handover in the ED. Hence, the results of this study can be presented to nursing managers and quality improvement managers of hospitals as a guide in improving the quality of nursing care via implementing and applying this strategy in the nursing handover. The ED structured nursing modified handover framework focused on a standardized approach, including checklists, with emphasis on nursing care and patient involvement. This straightforward and easy-to-implement strategy has the potential to enhance continuity of care and completion of aspects of nursing care tasks and documentation in the ED. **Strengths and limitations**

The present research is the first study to investigate the effect of the modified handover model on handover quality and nurses' perception of handover in Iran.

The modified handover model tool is a reliable and validated tool that can be easily implemented in ED



practice for sharing information among health care providers; however, there are limitations of use in patients with complex medical histories and care plans, especially in the critical care setting. In addition, the modified handover model tool requires training all clinical staff so that they can understand communication well. Future research might test whether introduction of this handover model in the ED setting results in actual enhanced patient safety, including reduction in medication errors.

The resistance of nurses against executing a new handover method was one of the limitations of the research, which was resolved by explanation of the plan and goals, as well as the cooperation of the hospital matron, and the ward supervisor.

#### Key points for policy, practice and/or research

- The results of this study can provide nursing managers with a model of nursing shift handover that promotes the quality of nursing care and patient-related concepts. Interventions could target a combination of the content, communication method, and location aspects of the modified handover model.
- Implementing a standardized handover framework such as the modified handover model method allows for concise and comprehensive information handoffs.
- The modified handover model tool might be an adaptive tool that is suitable for many healthcare settings, in particular when clear and effective interpersonal communication is required.
- The modified handover model provides an opportunity for omissions of information, documentation, or care to be identified and addressed at the commencement of a shift.

#### Future research

- Future studies on the validation of the modified handover model tool in various medical fields, strategies to reinforce the use of the modified handover model tool during all patient-related communication among health care providers, and comparison studies on the modified handover model tool communication tool would be beneficial.
- Translation of these findings for enhanced patient safety should be measured in the future, along with sustainability of the new nursing process and external validation of the findings in other settings.

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#### Author contributions

All authors contributed to the study conception and design, also all authors read and approved the final manuscript. Atefe Alizadeh-riseni, Zahra Fotokian: Study concept and design, Acquisition of subjects and/or data, Analysis and interpretation of data. Fatemeh Mohammadkhah, Ali Pourhabib: Study design, Analysis and interpretation of data, Preparation of manuscript. Marziyeh Khatooni: Analysis and interpretation of data.

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#### Data availability

The datasets used and/or analysed during the current study are available from the corresponding author upon reasonable request.

#### Declarations

##### Ethical approval and consent to participate

The Ethics Committee of Babol University of Medical Sciences approved this research proposal (coded under IR.MUBABOL.REC.1401.162). This research was conducted in accordance with the Declaration of Helsinki and all study participants provided written informed consent. The participant rights were preserved (all data were kept anonymous and confidential).

**Consent for publication** None.

##### Competing interests

The authors declare no competing interests.

##### Author details

<sup>1</sup>Student Research Committee, Nursing Care Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

<sup>2</sup>Nursing Care Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

<sup>3</sup>Department of Critical Care Nursing, School of Nursing and Midwifery, Qazvin University of Medical Sciences, Qazvin, Iran

<sup>4</sup>Correspondence: Zahra Fotokian; Nursing Care Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, Iran

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