

## Development and Evaluation of Standardized Inter-Shift Handover Tool in General Intensive Care Units

**Eman Arafa Hassan, Lecturer**

*Critical Care and Emergency Nursing, Faculty of Nursing, Alexandria University*

**Azza Abd El-Razek Baraka, Lecturer**

*Critical Care and Emergency Nursing, Faculty of Nursing, Alexandria University*

**Nancy Sabry El- Iiethey, Lecturer**

*Nursing Administration, Faculty of Nursing, Alexandria University*

### **Abstract**

*Missing critical information during handover interrupts the continuity of care and hazards the patients' safety. Most of the studies evaluated the use of IPASS to improve handover of critically ill patients from one hospital area to another, but little was found to evaluate handover during nursing shift change in the general intensive care units (ICUs). **Objective:** Develop and evaluate the standardized IPASS inter-shift handover tool in the general ICUs. **Settings:** Five general ICUs at the Alexandria Main University Hospital. **Subjects:** Two samples were enrolled in this study. The first sample was 77 experts who participated in the development of IPASS handover information. The second sample was 100 bedside critical care nurses who used and clinically evaluated the IPASS handover. **Tools:** Two tools were used to collect the data of the study. Tool I was the IPASS Handover Information Questionnaire. Tool II was the Evaluation of the Current Handover Questionnaire. **Results:** Consensus on important and relevant IPASS handover information was achieved after the second e-Delphi round (all  $p < 0.001$ ). 37% of the critical care nurses agreed that IPASS handover was clinically usable, and 53% strongly agreed on its clinical usability. **Conclusion:** The output of this study is an expert consensus and clinically usable IPASS handover information that is specific for nurses' inter-shift handover in the general ICUs. **Recommendations:** Use of the specific IPASS inter-shift handover information in the general ICUs.*

**Keywords:** Communication; e-Delphi; Handover; General intensive care unit; IPASS; Nursing shift.

### **Introduction**

Nursing handover from shift to shift is a summarization of the important data that is essential for the continuity of care (Ahn et al., 2020 & O'Connell, Macdonald & Kelly, 2008). Nursing handover in intensive care units (ICUs) is more challenging. Critical care nurses care for critically ill patients who have multiple diagnoses, receive high alert medications, and are attached to advanced health technology devices. Critical care nurses should communicate all this data without missing important one from nursing shift to another (LoefgrenVretare & Anderzén-Carlsson, 2020 & Spooner, Chaboyer, Corley, Hammond, & Fraser, 2013).

Many Researches revealed that the handover procedure varies in content depending on the context. Nurses' experience and values affect their data communication in handover procedure. The use of handover tool can minimize the variation in the handover procedure (LoefgrenVretare & Anderzén-Carlsson, 2020; Methangkool et al., 2019; & Malekzadeh, Mazluom, Etezadi, & Tasseri, 2013).

Standardized handover is structuring and improving handover content. It has been shown to be effective in reducing data omission and improving communication among health care providers (Marshall et al., 2019). The importance of standardized handover has been advocated by the World Health Organization action plan for patient

safety (WHO, 2006). Lack of standardization of handover increases the significant risk vulnerability due to their lack of structure, variability, and unreliability. Some researchers have verified that standardized handover improves communication, without significantly changing the handover duration (Gardiner et al., 2015).

The IPASS handover tool is a mnemonic that was developed by Starmer et al., (2012). This mnemonic refers to illness severity, patient summary, action list to do, situation awareness, and syntheses by the receiver. Each handover category of the IPASS has a blank section that can be expanded or shortened according to the clinical setting and patient's condition. While the blank section provides more flexibility, it increases the chance to skip important data within each category (Benton et al., 2020).

Many studies evaluated the IPASS handover for critically ill patients, but it was not specific to nursing inter-shift handover in the general ICU. Parent et al., (2018) evaluated the effect of using IPASS handover in medical and surgical ICUs, the study targeted the attending physician, but nurses were not included in the IPASS handover.

Furthermore, Benton et al., (2020) evaluated the electronic IPASS communication between the anesthesia unit and the ICU. The study focused on customization features with specific information essential for surgical patient transfer (Benton et al., 2020). On the other hand, Cifrese et al., (2019) implemented IPASS handover in neurological ICU. However, the study was not designed to assess the usability or the effect of implementing IPASS. It aimed to improve IPASS handover by attending supervision. Cifrese et al., (2019)

Starmer et al., (2017) evaluated IPASS nursing handover in pediatric intensive ICU. The IPASS improved the verbal handover

without a negative effect on nursing workflow. Also, Pariha et al., (2018) implemented the IPASS in a pediatric hematology/oncology unit using electronic low-cost infrastructure. The results of this study revealed increased satisfaction among the users.

### **Significance of the study:**

The standardized IPASS handover with its specified information can improve critical care nurses' communication without missing important events in patients' care as well as nursing diagnosis. The standardization of the IPASS handover tool may reduce errors and improve patient care and safety (Jimmerson et al., 2020; Studeny et al., 2017). A recent study highlighted the importance of standardized and up to date handover during nursing shift change (Rikos et al., 2019). In the current study, we specified IPASS inter-shift handover information in the general ICUs after two e-Delphi rounds. Then, critical care nurses assessed its clinical usability.

### **Aims of the Study**

This study aims to develop and evaluate specific IPASS inter-shift handover information in general ICUs.

### **Research Questions**

1. What is important and relevant information for IPASS inter-shift handover in general ICUs?
2. Is IPASS inter-shift handover information in general ICUs clinically usable?

### **Materials and Method**

#### **Materials**

**Design:** Mix of methodological and descriptive research design was used in this study. Methodological research design was an e-Delphi technique that was used to seek opinions from experts about what is important and relevant assessment information of IPASS category for critically ill patients. Then, descriptive research

design was used which was a questionnaire to evaluate the clinical usability of the specific IPASS information from critical care nurses.

**Settings:** Five general ICUs at Alexandria Main University Hospital, namely unit I, unit II, unit III, unit IV, and unit V. The total number of beds in these ICUs was 56 beds. These ICUs receive medical and trauma patients in the acute stage of illness directly from the emergency department or transferred from other hospitals.

**Subjects:** Two subjects were enrolled in this study. The first subject was experts of 77 nurses from the following different positions; staff nurses with more than five years' experience in the ICU, in charge nurses, head nurses, quality members, and training members. The exclusion criteria were nurses who had less than 5 years working experience in the ICUs. The sample size was determined using power analysis Epi-info7 program based on the following parameters: population size is 100, acceptable error 10%, confidence coefficient 99% and expected frequency 50%.

The second sample was 100 bedside critical care nurses who used the IPASS to handover their patients from one shift to another. The exclusion criteria were nurses who had less than six months working experience in the ICUs. The sample size was determined using power analysis Epi-info7 program based on the following parameters: population size is 120 over three months, acceptable error 5%, confidence coefficient 98% and expected frequency 30%.

**Tools:** Two tools were used to collect data of the study:

### **Tool I: The IPASS Handover Information Questionnaire**

This tool was developed by the researchers after reviewing the relevant literature (Cifrese et al., 2019; Methangkool et al., 2019; Starmer et al., 2012). This tool was used to identify important and relevant information that should be included in the handover. The tool included three parts:

**Part I** was the demographic and work information about the nurse experts and bedside nurses; as age, gender, position, and years of experience .

**Part II:** This part was used for evaluating each piece of information from the IPASS handover for inclusion or exclusion from the subjects' point of view. Each piece of information was evaluated against whether it should be included or excluded.

### **The scoring system**

The response system for this part was as follows; if the response was yes, scored by 1, and if the response was no, scored by zero. The scoring system if 90% or more of agreement on inclusion or exclusion was determined as the cut off point for inclusion or exclusion of the information.

**Part III:** This part was used for rating the included information against their importance, and relevance on a five-point Likert scale. The score of 5 indicted that it was extremely important and relevant, while the score of 1 was not at all relevant nor important.

### **Tool II: Evaluation of the Current Handover Questionnaire**

This tool was adopted from Benton et al., (2020). It was a valid and reliable tool. Its reliability was 0.87, which is acceptable. This tool was used to evaluate the usability of the IPASS handover procedure. It consists of 13 items which is rated at 5 points on the Likert scale. The tool's five items were rated against agreement, with scores ranging from strongly disagree (one) to strongly agree (five). The other eight items of the tool were rated against frequency of occurrence which ranged from never that was scored by one to always which was scored by five.

### **Method**

- An approval was obtained from the Faculty of Nursing, Alexandria University and the Ethical committee to pursue the research.

- An approval was obtained to conduct the study from the responsible authorities of the study hospital settings after explaining the purpose of the study.
- Data for this study was collected over nine months from May 2019 to February 2020. The data was collected over three phases:

#### **Phase I: Developing information for IPASS handover**

- A comprehensive literature review was conducted to develop content for each IPASS category. The specific assessment data which fits each category was added. The search process was guided by the following research questions. The first question was, "What is the critical assessment information of handover in critically ill patients?" The second question was what is the relevant assessment information for each IPASS category?

#### **Phase II: Judgment and quantification of IPASS information**

- Two e-Delphi rounds were conducted to judge and quantify IPASS information. Tool one was used for this purpose. The reliability of the tool was tested using Cronbach alpha reliability which was 0.92, which is acceptable. Then, two rounds of questionnaires were delivered via email. Each round was open for two weeks, and reminders were emailed at the beginning, after one week, and at the end of the second week.
- The first and second rounds were separated by two weeks. The first and second questionnaires took approximately 30 minutes to complete. In this questionnaire, experts filled in their demographic and work information. Then, they selected the information that should be included in the IPASS handover. Finally, they rated the selected

information against its relevance and importance.

- This phase was important to ensure that all data within the category provides the receiver of handover with relevant and important data that can be generated adequately to provide accurate information about the patient.
- Suggestions from the first round were considered, and some were incorporated into the second round if all the experts agreed. Achievement of a consensus is the standard for completion of the Delphi process, and a consensus was reached in this study after the second round.
- Consensus was defined a priori as at least 90% agreement. Consensus was reached when an assessment data was ranked as important and relevant or not important nor relevant with little change from the previous round, and information was then retained or deleted as appropriate.

#### **Phase III: Evaluating the clinical usability of IPASS handover**

- Evaluating the clinical usability of IPASS handover was conducted in two steps. The first step is integration of IPASS handover into nursing records, and the second step is assessing the clinical usability of IPASS handover .
- Integration of IPASS handover into nursing records
- The IPASS was introduced to the ICU nurses, who received a comprehensive two-hour lecture followed by one-hour clinical training on how to use the IPASS handover. The IPASS handover sheet was then incorporated into nursing records for visual aid during verbal handover.
- Assessing the clinical usability of IPASS handover

- The timing of assessing the clinical usability of the IPASS handover was three months after introduction to the ICUs. The evaluation of the current handover questionnaire was used. The questionnaire was filled by critical care nurses who implemented IPASS handover for at least one month during the three months of IPASS use in the ICUs. The total number of nurses who responded to the survey was 100 nurses. In this questionnaire, nurses rated the IPASS's clinical usability on a five-point liker scale.

#### **Ethical considerations:**

- Experts were asked to check on the informed agreement button before beginning to participate in the study.
- A written informed consent from the staff nurses was obtained after explanation of the study's aim.
- Participation in the study was on a voluntary basis.
- Anonymity and privacy of subjects was ensured.
- Confidentiality of the data was maintained.
- The right to withdraw from the study at any time was explained and assured.

#### **Statistical Analysis**

Frequency was expressed in number and percent. The mean, standard deviation and coefficient of variation were determined for each category of IPASS handover. Coefficient of variation  $\leq 0.3$  indicated less variability of the panel members' opinions.

The Kendall coefficient of concordance was used to evaluate the agreement among raters. All statistical analyses were carried out with IBM SPSS statistical software version 25.0 for Windows (IBM Corp., New York, NY, USA). A two-tailed p-value  $< 0.05$  was considered statistically significant.

#### **Results**

**Table (1)** illustrates the characteristics of the participants. The mean age of the experts was  $36.57 \pm 7.79$ , and the majority (90.9%) of them were females. Their educational attainment was 70.1% bachelor, 22.1% master, and 7.8% doctoral. The expert panel consisted of 32 (41.6%) staff nurses, 23 (29.9%) in charge nurses, 11 (14.3%) head nurses, 5 (6.5%) quality members, and 6 (7.8%) training members. The mean ICU experience of the experts was  $14.85 \pm 6.26$ .

The average age of bedside nurses who used the IPASS handover was  $31.7 \pm 8.9$ . More than half of them (68%) were female. 21% of them had a diploma in nursing, 34% had a technical nursing degree, and 45% had a bachelor's degree. Their mean years of experience was  $9.87 \pm 4.17$ .

**Table (2)** shows the frequency distribution for the experts' decision on inclusion or exclusion of information in the IPASS handover. All information in the IPASS handover was included as they reached more than 90% consensus of inclusion, except two items. The two items are patient scoring systems and ICU triad (pain, agitation, delirium). They reached only 85.71% and 89.61% consensus of inclusion respectively.

**Table (3)** illustrates the agreement of experts regarding the importance and relevance of information in IPASS handover. In the first, all of the IPASS handover categories had a coefficient of variation (CV) of  $\geq 0.3$  which indicate that there was no agreement among experts on the relevance and importance of information, with the exception of the importance of syntheses by the receiver information, which had a CV of 0.24. In the second round, all the IPASS handover categories had CV of  $\leq 0.3$ , which indicates a high consensus among experts on the relevance and importance of the information. There was a significant disagreement value in the first round, while

there was a significant agreement value in the second round (all  $p < 0.001$ ).

**Table (4)** illustrates the evaluation of the IPASS inter-shift handover procedure. More than half (57%) of nurses strangely agreed that they had a chance to ask questions in the IPASS handover. Also, more than half (54%) of nurses always receive information about potential problems. Moreover, more than half (52%) of nurses never reported that the description of the patient received during handover did not match the subsequent clinical assessment. The majority (91%) of nurses never reported that critical information about the patient was omitted during handover. Finally, 37% of nurses agreed that IPASS handover was clinically usable, while 53% strongly agreed on its clinical feasibility.

### **Discussion**

Prevention of communication errors in ICU handover is a challenge because the ICU is considered to be a complex and multidisciplinary health care context in which critical care nurses are trained and prepared to provide the suitable care for the critically ill patients. Thus, effective handover communication among critical care nurses is considered as a particularly imperative prerequisite for high-quality care (Dalky et al., 2020; Wang et al., 2018).

An e-Delphi method was used in the current study to develop consensus among critical care nurse experts about IPASS handover assessment data. In addition, assessment for the clinical usability of the IPASS handover after its assessment information specification was done and all the critical care nurses' response ranged from agree to strongly agree on its clinical usability.

The Agency for Healthcare Research and Quality (AHRQ) emphasized on items that should be communicated to improve patients' safety (AHRQ, 2013). The communication includes verbal report of the situation, background, assessment, and recommendation. It also includes review

tasks such as laboratories, tests, medication administration, and forms. It also emphasized on focused assessment of the patient (i.e. wounds, incisions, drains, IV sites, IV tubing, catheters) and identifying if the patient or family has any needs or concerns. In congruency with the AHRQ recommendations, the current study involved the same information in the IPASS handover. This information should be included, according to expert consensus.

The Joint Commition in 2017 highlighted contents that should be included in the handover (The Joint Commition, 2017). It includes sender illness assessment, and illness severity. The current study also included the same information in the IPASS handover, but the detailed scoring systems that indicate severity of illness were excluded from the IPASS information.

The expert's reasoning was that a large number from the scoring system could confuse the critical care nurse. They also emphasized that interpretation of the scoring system should be communicated in a narrative way in the patient diagnosis information. Also, the Joint Commition (2017) emphasized that the handover should include a to do action list. The current study also included an action list to do and emphasized on the priority of this list.

Because of the nature of the critical illness, the detailed vital signs that are recommended by the Joint Commition (2017) were replaced in the IPASS handover. The IPASS handover involved recent changes in hemodynamic stability. Hemodynamics involve vital signs and more critical data about the cardiovascular and respiratory function (Buitenwerf et al., 2019).

There are many advantages for the implementation of a standardized handover tool. Evidence from a study suggested that a clinical handover is noted to increase the level of visibility in hospital policies as well as in operating procedures (Shahid & Thomas, 2018). Similarly, nurses in the

current study reported that using IPASS handover information reduced missing information and made information clearer from start to finish.

Spooner et al., (2013) analysis of the content of 40 nurses' handover revealed the absence of data on the current situation. Also, 40% of long-term care plans failed to be read. Another study for nursing handover in the ICU reported that there was incomplete data for assessment, care plans and communication of treatment (Abraham et al., 2016). This lack of significance can be attributed to the lack of standardization of the handover with specific relevant and important assessment data (Dalky et al., 2020).

In contrary to the previous studies, critical care nurses in the current study reported that plan of care was cleared during handover and potential problems were highlighted. They also reported that complete data was transferred, and highly important information was never missed during the handover. The clear communication and reduction of missing information in the current study refer to the specification of information in each IPASS category.

### **Conclusion**

Based upon the findings of the current study, it could be concluded that expert consensus on IPASS handover assessment information that provides a standardized and clinically usable format for critical care nurses handover between shifts.

### **Recommendations**

*In line with the findings of the study, the following recommendations are made:*

- **For educational settings:** Integration of IPASS handover into the curriculum of the nursing administration
- **For clinical practice:** Use the current IPASS handover information in critical care nurses' handover with the nurse intern during shift handover. Furthermore, developing a training program for nursing staff about using the IPASS tool during shift handover.
- **For hospital administration:** Integration of the IPASS handover information into general ICUs policies and procedures and use it as a standardized tool for shift report.
- **For further studies:** Further studies are needed to evaluate the effect of implementing IPASS handover on patients' safety and improvement of nurses' communication and the nurses' sensitive outcome.

**Table (1): Characteristics of the participants**

<b>Characteristics of the participants</b>	<b>Experts (n=77) n (%) or mean <math>\pm</math> SD</b>	<b>Bedside nurses (n=100) n (%) or mean <math>\pm</math> SD</b>
<b>Age</b>	36.57 $\pm$ 7.79	31.7 $\pm$ 8.9
<b>Gender</b>		
Male	7 (9.1%)	32 (32%)
Female	70 (90.9%)	68 (68%)
<b>Educational attainment</b>		
Diplomat	0 (0%)	21 (21%)
Technical	0 (0%)	34 (34%)
Bachelor	54 (70.1%)	45 (45%)
Master	17 (22.1%)	0 (0%)
Doctoral	6 (7.8%)	0 (0%)
<b>Title</b>		
Staff nurse	32 (41.6%)	100 (100%)
In charge nurse	23(29.9%)	0 (0%)
Head nurse	11(14.3%)	0 (0%)
Quality member	5 (6.5%)	0 (0%)
Training member	6 (7.8%)	0 (0%)
<b>Years of ICU experience</b>	14.85 $\pm$ 6.26	9.87 $\pm$ 4.17

**Table (2): Frequency distribution for the experts' decision on inclusion or exclusion of information in the IPASS handover (n=77)**

IPASS information	First round		First round	
	Inclusion	Exclusion	Inclusion	Exclusion
<b>Illness severity</b>				
Name	77 (100%)	0 (0%)	77 (100%)	0 (0%)
Age	77 (100%)	0 (0%)	77 (100%)	0 (0%)
Severity scores	69 (89.61%)	8 (10.39%)	72 (93.51%)	5 (6.49%)
Diagnosis	77 (100%)	0 (0%)	77 (100%)	0 (0%)
History	76 (98.7%)	1 (1.3%)	77 (100%)	0 (0%)
Events lead to ICU admission	76 (98.7%)	1 (1.3%)	77 (100%)	0 (0%)
<b>Patient summary</b>				
Hospital course interventions and care provided	77 (100%)	0 (0%)	77 (100%)	0 (0%)
Ongoing assessment findings	71 (92.21%)	6 (7.79%)	71 (92.21%)	6 (7.79%)
Current plan of care	77 (100%)	0 (0%)	77 (100%)	0 (0%)
Recent changes in hemodynamics	74 (96.1%)	3 (3.9%)	75 (97.4%)	2 (2.6%)
Oxygen therapy	77 (100%)	0 (0%)	77 (100%)	0 (0%)
Nutrition therapy	71 (92.21%)	6 (7.79%)	71 (92.21%)	6 (7.79%)
Bowel function	69 (89.61%)	8 (10.39%)	73 (94.81%)	4 (5.19%)
Wounds/incisions/bed sores	72 (93.51%)	5 (6.49%)	74 (96.1%)	3 (3.9%)
Attached tube/catheters	71 (92.21%)	6 (7.79%)	76 (98.7%)	1 (1.3%)
Attached technological devices	70 (90.91%)	7 (9.09%)	70 (90.91%)	7 (9.09%)
High alert medications	70 (90.91%)	7 (9.09%)	72 (93.51%)	5 (6.49%)
<b>Action list to do</b>				
Timing of diagnostic studies	74 (96.1%)	3 (3.9%)	77 (100%)	0 (0%)
Sending investigations	70 (90.91%)	7 (9.09%)	77 (100%)	0 (0%)
Receiving investigation result	72 (93.51%)	5 (6.49%)	77 (100%)	0 (0%)
Sending medical/ surgical consultation	75 (97.4%)	2 (2.6%)	76 (98.7%)	1 (1.3%)
<b>Situation awareness</b>				
Infectious precautions	69 (89.61%)	8 (10.39%)	75 (97.4%)	2 (2.6%)
Allergy precautions	71 (92.21%)	6 (7.79%)	76 (98.7%)	1 (1.3%)
Patient scoring systems	66 (85.71%)	11 (14.29%)	66 (85.71%)	11 (14.29%)
Medication precaution	74 (96.1%)	3 (3.9%)	77 (100%)	0 (0%)
Fall risk	72 (93.51%)	5 (6.49%)	76 (98.7%)	1 (1.3%)
ICU triad (pain, agitation, delirium)	67 (87.01%)	10 (12.99%)	69 (89.61%)	8 (10.39%)
Treatment refusal	76 (98.7%)	1 (1.3%)	77 (100%)	0 (0%)
Patients/family concern	71 (92.21%)	6 (7.79%)	74 (96.1%)	3 (3.9%)
<b>Syntheses by the receiver</b>				
Ask questions	77 (100%)	0 (0%)	77 (100%)	0 (0%)
Confirm plan of care	75 (97.4%)	2 (2.6%)	76 (98.7%)	1 (1.3%)

**Table (3): Agreement of experts regarding the importance and relevance of information in IPASS handover**

IPASS handover information categories	First round (n=77)						Second round (n=77)					
	Importance			Relevance			Importance			Relevance		
	Me an	SD	CV	Me an	SD	CV	Me an	SD	CV	Me an	SD	CV
Illness severity information	3.77	0.67	0.45	4.19	0.81	0.66	4.23	0.60	0.17	4.29	0.79	0.02
Patient's summary information	2.50	0.95	0.91	2.45	0.96	0.90	3.78	0.80	0.15	3.62	0.86	0.13
Action list to do information	2.45	0.91	0.83	2.29	0.74	0.55	3.97	0.91	0.22	3.84	0.89	0.19
Situation awareness information	3.20	0.64	0.40	2.72	1.09	1.20	4.10	0.64	0.11	4.08	0.68	0.07
Syntheses by the receiver information	4.09	0.49	0.24	3.90	0.75	0.56	4.12	0.52	0.27	4.35	0.72	0.22
<b>General IPASS information agreement</b>	<b>W =0.51 X<sup>2</sup> = 156.98 P&lt;0.001</b>			<b>W = 0.52 X<sup>2</sup> = 158.21 P&lt;0.001</b>			<b>W = 0.25 X<sup>2</sup> = 94.52 P&lt;0.001</b>			<b>W = 0.22 X<sup>2</sup> = 86.25 P&lt;0.001</b>		

SD: standard deviation, CV: coefficient of variation, W: Kendall coefficient of concordance

**Table (4): Evaluation of the IPASS inter-shift handover procedure (n=100)**

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I received anticipatory guidance	0 (0%)	10 (10%)	5 (5%)	62 (62%)	23 (23%)
I had a chance to ask questions	0 (0%)	0 (0%)	0 (0%)	43 (43%)	57 (57%)
Handover start and end were clear	6 (6%)	11 (11%)	7 (7%)	17 (17%)	29 (29%)
Items	Never	Rarely	Sometimes	Very often	Always
How often was information about potential problems received?	0 (0%)	0 (0%)	26 (26%)	20 (20%)	54 (54%)
How often was the information provided during handover unclear or un concise?	31 (31%)	67 (67%)	2 (2%)	0 (0%)	0 (0%)
How often did the description of the patient received during handover not match the subsequent clinical assessment?	52 (52%)	41(41%)	4 (4%)	3 (3%)	0 (0%)
How often was incorrect information provided during handover?	17 (17%)	83 (83%)	0 (0%)	0 (0%)	0 (0%)
How often do you have to call back or look elsewhere for information after handover?	39 (39%)	38 (38%)	23 (23%)	0 (0%)	0 (0%)
How often was insufficient information provided during handover?	39 (39%)	38 (38%)	23 (23%)	0 (0%)	0 (0%)
How often critical information about the patients was omitted during handover?	91 (91%)	9 (9%)	0 (0%)	0 (0%)	0 (0%)
Totally usable	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
It is clinically usable	0 (0%)	0 (0%)	0 (0%)	37(37%)	53(53%)

## References

- Abraham, J., Kannampallil, T., Brenner, C., Lopez, K. D., Almoosa, K. F., Patel, B., & Patel, V. L. (2016). Characterizing the structure and content of nurse handoffs: a sequential conversational analysis approach. *Journal of biomedical informatics*, 59, 76-88.
- Ahn, J. W., Jang, H. Y., & Son, Y. J. (2020). Critical care nurses' communication challenges during handovers: A systematic review and qualitative meta-synthesis. *Journal of Nursing Management*. 29(4), 623-634. <https://doi.org/10.1111/jonm.13207>
- AHRQ. 2013. "Strategy 3: Nurse Bedside Shift Report | Agency for Healthcare Research and Quality." *Agency for Healthcare Research and Quality*. Retrieved February 6, 2021. <https://www.ahrq.gov/patient-safety/patients-families/engagingfamilies/strategy3/index.html>.
- Benton, S. E., Hueckel, R. M., Taicher, B., & Muckler, V. C. (2020). Usability Assessment of an Electronic Handoff Tool to Facilitate and Improve Postoperative Communication Between Anesthesia and Intensive Care Unit Staff. *CIN: Computers, Informatics, Nursing*, 38(10), 500-507.
- Buitenwerf, E., Boekel, M. F., van der Velde, M. I., Voogd, M. F., Kerstens, M. N., Wietasch, G. J., & Scheeren, T. W. (2019). The haemodynamic instability score: Development and internal validation of a new rating method of intra-operative haemodynamic instability. *European Journal of Anaesthesiology (EJA)*, 36(4), 290-296.
- Cifrese, L., Gill, S., Margiotta, M., & Dolla, A. (2019). Implementation of Attending-Supervised IPASS Handoffs in the Neuro-ICU (P5.9-056)." *Neurology* 92(15 Supplement).
- Dalky, H. F., Al-Jaradeen, R. S., & AbuAlRub, R. F. (2020). Evaluation of the Situation, Background, Assessment, and Recommendation Handover Tool in Improving Communication and Satisfaction Among Jordanian Nurses Working in Intensive Care Units. *Dimensions of Critical Care Nursing*, 39(6), 339-347.
- Gardiner, T. M., Marshall, A. P., & Gillespie, B. M. (2015). Clinical handover of the critically ill postoperative patient: an integrative review. *Australian Critical Care*, 28(4), 226-234.
- Jimmerson, J., Wright, P., Cowan, P. A., King - Jones, T., Beverly, C. J., & Curran, G. (2021). Bedside shift report: Nurses opinions based on their experiences. *Nursing Open*, 8(3), 1393-1405.
- Malekzadeh, J., Mazluom, S. R., Etezadi, T., & Tasserri, A. (2013). A standardized shift handover protocol: Improving nurses' safe practice in intensive care units. *Journal of caring sciences*, 2(3), 177.
- Marshall, A. P., Tobiano, G., Murphy, N., Comadira, G., Willis, N., Gardiner, T., ... & Gillespie, B. M. (2019). Handover from operating theatre to the intensive care unit: A quality improvement study. *Australian Critical Care*, 32(3), 229-236.
- Methangkool, E., Tollinche, L., Sparling, J., & Agarwala, A. V. (2019). Communication: Is there a standard handover technique to transfer patient care?. *International anesthesiology clinics*, 57(3), 35.
- Parent, B., LaGrone, L. N., Albirair, M. T., Serina, P. T., Keller, J. M., Cuschieri, J., ... & Kritek, P. A. (2018). Effect of standardized handoff curriculum on improved clinician preparedness in the intensive care unit: a Stepped-Wedge cluster randomized clinical trial. *JAMA surgery*, 153(5), 464-470.
- Pariha, S., Saeed, S., Qureshi, S., & Altaf, S. (2018). Implementation of a low-cost standardized handoff system (IPASS) in a pediatric hematology/oncology unit: Lessons from a low-middle income country. *Journal of Clinical Oncology* 36(30\_suppl):278-278.
- Rikos, N., Linardakis, M., Economou, C., Rovithis, M., & Philalithis, A. (2019). The nurses' own views about the inter-shift

- handover process. *Contemporary nurse*, 55(1), 83-94.
- Shahid, S., & Thomas, S. (2018). Situation, background, assessment, recommendation (SBAR) communication tool for handoff in health care—a narrative review. *Safety in Health*, 4(1), 1-9.
  - Spooner, A. J., Chaboyer, W., Corley, A., Hammond, N., & Fraser, J. F. (2013). Understanding current intensive care unit nursing handover practices. *International journal of nursing practice*, 19(2), 214-220.
  - Starmer, Amy J., Kumiko O. Schnock, Aimee Lyons, Rebecca S. Hehn, Dionne A. Graham, Carol Keohane, and Christopher P. Landrigan. 2017. “Effects of the I-PASS Nursing Handoff Bundle on Communication Quality and Workflow.” *BMJ Quality and Safety* 26(12):949–57.
  - Starmer, A. J., Spector, N. D., Srivastava, R., Allen, A. D., Landrigan, C. P., Sectish, T. C., & I-PASS study group. (2012). I-pass, a mnemonic to standardize verbal handoffs. *Pediatrics*, 129(2), 201-204.
  - Studeny, S., Burley, L., Cowen, K., Akers, M., O’Neill, K., & Flesher, S. L. (2017). Quality improvement regarding handoff. *SAGE open medicine*, 5, 2050312117729098.
  - The Joint Commition. 2017. “Sentinel Event Alert 58: Inadequate Hand-off CommunicationThe Joint Commission.” Retrieved February 6, 2021. <https://www.jointcommission.org/resources/patient-safety-topics/sentinel-event/sentinel-event-alert-newsletters/sentinel-event-alert-58-inadequate-hand-off-communication/>.
  - Wang, Y. Y., Wan, Q. Q., Lin, F., Zhou, W. J., & Shang, S. M. (2018). Interventions to improve communication between nurses and physicians in the intensive care unit: An integrative literature review. *International journal of nursing sciences*, 5(1), 81-88.
  - WHO. 2006. “Action on Patient Safety: High 5s.” Retrieved January 30, 2021. [https://www.who.int/patientsafety/solutions/high5s/High5\\_overview.pdf](https://www.who.int/patientsafety/solutions/high5s/High5_overview.pdf).
  - Vretare, L. L., & Anderzen-Carlsson, A. (2020). The critical care nurse’s perception of handover: A phenomenographic study. *Intensive and Critical Care Nursing*, 58, 102807.