Research
Handover Patterns in the PACU: A Review of the Literature
Xiu-li Wang, MNS, Miao He, BNS, Yi Feng, MD *
Department of Anesthesiology, Peking University People’s Hospital, Beijing, China

ABSTRACT

Purpose: Currently, there is no standardized handover pattern for patients undergoing general anesthesia when being transferred to the postanesthesia care unit (PACU).
Design: A review of the literature.
Methods: In this study, a review of the literature was conducted to analyze the PACU handover status, factors for poor handover, and commonly used handover patterns.
Findings: Important handover information was often omitted during the handover of PACU patients, and there were many factors influencing postoperative patient handover quality. This study analyzed and compared several commonly used handover patterns for patients. Among these, the Situation-Background-Assessment-Recommendation tool is relatively mature. However, there is currently no unified standardized patient handover pattern, and the validity and applicability of tools still need to be verified.
Conclusions: PACU is an important place for the recovery of surgical patients. Anesthesia providers need to provide PACU nurses with complete and comprehensive postoperative handover information. A standardized handover model for clinical nurses is needed to improve patient safety management and work efficiency.

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Handover refers to the transfer of professional responsibility and accountability for some or all aspects of patient care to another person or professional group on a temporary or permanent basis.1 The postoperative handover process is a critical stage in surgical patient care. According to the report, handovers between anesthesia providers and registered nurses in the postanesthesia care unit (PACU) are frequent, and the content is easily distorted.2 Because general anesthesia patients account for a large proportion of PACU patients, adverse events caused by handover lapses are more likely to lead to severe consequences than other types of anesthesia patients. One of the practical approaches to ensure the safety of patients is a thorough handover communication. The purpose of this review was to describe the current status of handover, identify risk factors for poor handover, and summarize the handover patterns during transfer to the PACU in an effort to help medical workers choose clinical management tools.

Background
PACU Patient Handover

The purpose of handover is to transfer information accurately, such as the current patient condition and care plan. It is designed to promote the safety and continuity of nursing.1 High-quality handovers are vital to improve the quality of health care delivery. In current clinical nursing practice, there is no standardized handover mode for postoperative patients admitted to the PACU after general anesthesia,4 and the handover process often happens in a nonsystematic way. Several studies have shown that communication problems partially contribute to the occurrence of postoperative adverse events in patients during the handover process.5-7 Also, once the patient is transferred to the PACU, nurses are busy monitoring and assessing the patient, so the handover is often brief and informal, and the content is usually incomplete, inaccurate, and irregular. Therefore, the omission of valuable information and communication barriers is quite common during PACU handover.8-11 In conclusion, a clear and structured handover mode is one of the most effective ways to help health care workers improve information recall for handover content and therefore improve patient safety.7

Conflict of interest: None to report.
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* Address correspondence to Yi Feng, Department of Anesthesiology, Peking University People’s Hospital, No. 11 Xizhimen South Street, Xicheng District, Beijing 100044, China.
E-mail address: doctor_yifeng@sina.com (Y. Feng).
Factors for Poor Handover

Patients
The patient is the core of the handover process. For patients with general anesthesia, consciousness and muscle activity will gradually recover after transfer to the PACU, and adverse events such as extubation may occur during the handover process. Therefore, providers may distract their attention to dealing with emergencies, thereby increasing the handover time and affecting the quality of the handover.

Anesthesiologists and Nurses
Because much is unknown about patient’s information, nurses in the PACU need to comprehend complex information quickly during the handover process. Anesthesia providers and nurses have different concerns about the patient’s condition, so the content of the handover may differ. Multiple nurses may participate in the handover process. If the nurse responsible for the handover is unclear, it may result in patient information being missed or confused, and potentially fatal problems may occur.

Environmental Factors
The PACU environmental structure is complex and often affected by policy and nursing standards. Most PACUs tend to be laid out as a large open room with beds arranged in a centralized way to optimize workflow. Handover in this setting is likely to be disturbed and interrupted by ongoing nursing activities. In addition, the limited number of PACU beds may lead to a greater emphasis on turnover efficiency. When allocated handover time is insufficient, valuable patient information may be omitted.

Many of the risks for poor handover, such as frequent interruptions, anesthesia providers and nurses having different priorities for patients, and multiple nurses caring for each patient, can increase the danger to the patient. Accurate and standardized handover methods should be adopted in an effort to enhance patient safety in the PACU and prevent such undesired outcomes.

Methodology and Search Strategies
A comprehensive review method was used to search for handover patterns related to PACU patients. The literature review was based on research topics relevant to the patient’s handover in PACU and the following databases were searched for primary studies: PubMed, Embase, Web of Science, CNKI, Wanfang Data, and VIP. The search terms included handover(s)/handoff, postoperative handover(s)/postoperative handoff, patterns/checklists/tools/measure-ment/communication, postanesthesia care unit/PACU. Inclusion and exclusion criteria were as follows: articles considered if written in English or Chinese language, and published in a public forum within the last 10 years. The study design included primary studies and mixed methods, and instrument validation studies, and excluded discussion articles, editorials, and qualitative studies. In addition, references of all the articles were manually searched. Each article was reviewed for quality of study design and relevance of findings (Figure 1).

Results
Eight studies were recognized as being important and relevant to the topic. Exclusion criteria included handover patterns for other purposes such as in intensive care unit or inpatient ward. A detailed description of the handover patterns is provided in Tables 1 and 2.

Discussion
Situation-Background-Assessment-Recommendation Tool
Situation-Background-Assessment-Recommendation (SBAR) communication tool is a way to transmit vital information in complex environments and initially used by the US Navy in high-risk situations. World Health Organization recommends that the SBAR can be used for nursing. SBAR includes the situation (description of the clinical situation of the patient), background

![Figure 1](https://www.jopan.org)

Table 1
Handover Pattern Articles Included in This Review

<table>
<thead>
<tr>
<th>Authors</th>
<th>Handover Patterns</th>
<th>Number of Participants</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article 1</td>
<td>Weinger et al20</td>
<td>SBAR and multimodal intervention</td>
<td>A multimodal intervention substantially improved interprofessional PACU handovers, including those by clinicians who had not undergone formal simulation training</td>
</tr>
<tr>
<td>Article 2</td>
<td>Guo et al21</td>
<td>SBAR</td>
<td>The application of self-designed SBAR model handover sheet in the PACU improved the quality of nursing and promoted the patient's safety and health</td>
</tr>
<tr>
<td>Article 3</td>
<td>Street et al25</td>
<td>iSoBAR</td>
<td>The structured discharge and Postanesthetic Care iSoBAR tool was associated with improved nursing management of patients in the PACU and enabled early identification and response to clinical concerns</td>
</tr>
<tr>
<td>Article 4</td>
<td>Redley et al26</td>
<td>iSoBAR, COLD</td>
<td>The standard structure and checklists for optimal content of patient handovers were derived from existing practices and consensus, hence, expected to provide ecologically valid and practical resources to improve quality and safety during clinical handovers in the PACU</td>
</tr>
<tr>
<td>Article 5</td>
<td>Robinson et al15</td>
<td>PEARLS</td>
<td>Evidence-based perioperative hand-off communication facilitates expedited patient evaluation, rapid interventions, reduction in adverse events, and a safer perioperative environment</td>
</tr>
<tr>
<td>Article 6</td>
<td>Liu et al27</td>
<td>Visual turntable nursing sign</td>
<td>Visualized turntable nursing sign can highlight the nursing characteristics of surgical patients to ensure the safety of patients and improve the quality of nursing</td>
</tr>
<tr>
<td>Article 7</td>
<td>Gao et al28</td>
<td>ABCDEFP</td>
<td>ABCDEFP application can improve the efficiency and quality of surgical patient handover, reduce the occurrence of adverse events, and enhance safety, which is worthy of clinical application</td>
</tr>
<tr>
<td>Article 8</td>
<td>Milby et al11</td>
<td>Checklist</td>
<td>Postoperative handovers in the PACU are in most cases incomplete. It appears useful to optimize the postoperative handover process, for example by implementing a standardized handover checklist</td>
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</table>

ABCDEFP, airway, breathing, circulation, disability, exposure, focus, plan; COLD, Connect-Observable-Listen-Delegate; iSoBAR, Identify-Situation-Observations-Background-Agreed plan-Read back; PACU, postanesthesia care unit; SBAR, Situation-Background-Assessment-Recommendation.

(patient’s medical history), assessment (information that currently reflects the patient’s condition), and recommendation (further treatment, management, and monitoring to prevent possible crises).18,19

Weinger et al20 used SBAR to create a standardized PACU electronic handover tool. A refined and pilot tested handover evaluation tool is a part of multimodal interventions used to evaluate the quality of handover for medical workers after being trained, and the results showed that the handover quality improved after the intervention.18 As a quality improvement project, the study concluded the positive effect of the intervention for handover quality. Still, future research needs to clarify the relative contributions of the SBAR tool in this multimodal intervention. Besides, the author did not measure the outcomes of the patients. The patient is the core in the process of handover, and the incidence of adverse events is essential to measure the quality of the handover. Guo et al11 made a paper version of the SBAR handover checklist for patients undergoing surgery with general anesthesia. The author evaluated the incidence of adverse events such as respiratory depression, airway obstruction, bed fall, and fluid leaking during handover. Results showed that the checklist can effectively reduce the adverse events brought by the subjective judgment of health care workers because of an unclear handover. The SBAR tool improved nurses’ observation and emergency management abilities while enhancing the satisfaction of handover workers.21

SBAR is an easy-to-remember communication mode that is widely used in medical services, patient handover, and disease reporting.22,23 However, for the application to patients transferred to the PACU, more relevant studies are needed to confirm the reliability of this model, and a standardized SBAR handover model needs to be verified, tested, and promoted in the future.

Identify-Situation-Observations-Background-Agreed plan-Read back Protocol

Identify-Situation-Observations-Background-Agreed plan-Read back (iSoBAR) protocol is a standardized clinical handover tool developed by the Western Australian Health Committee based on the existing SBAR handover tool.24 The iSoBAR protocol consists of six parts: identify (basic patient information), situation (description of the patient’s clinical situation), observation (recent vital signs and clinical evaluation), background (medical history), agreed plan (assessment of what happened to the patient), and read back (clarify and verify the handover information).25 At present, this model has been used in various clinical settings.24,25

Street et al25 developed a Postanesthetic Care Tool that was based on evidence and expert consultation. One of the components contained in the tool is the iSoBAR handover checklist. The results showed that PACU nurses were in a position to detect early postoperative complications such as hypothermia, nausea, vomiting, and pain, and implement management strategies more quickly after using the tool, thereby improving patient comfort and safety. Furthermore, iSoBAR increased nurses’ attention to the handover inspection and improved the clarity of the handover work. At the same time, after applying this tool, the handover content increased.25 However, the iSoBAR model is only part of postoperative care tools in the study. Therefore, the exact impact of this model on the initial identification of patient complications still needs further study. Redler et al26 applied a mixed methods approach and compiled the iSoBAR verbal handover list. Redler et al suggest that iSoBAR provides a structure for verbal handover, and the content was confirmed and verified by focus group clinicians.26

The model was verified through observations and discussions at three hospitals. However, further research is needed to confirm this.

In summary, the standardized iSoBAR handover mode can prevent and reduce the occurrence of patient adverse events, and improve teamwork and communication. In present research, the iSoBAR is mostly used together with other research tools. Moreover, compared with SBAR, iSoBAR covers more patient information, and it also adds confirmation of who is responsible for the handover. However, more research and application is needed to verify its clinical practicality. In addition, it needs to be compared with the SBAR to determine which is more suitable for PACU patient handover.

PEARLS Tool

The PEARLS tool is an evidence-based perioperative handover tool developed by Robinson based on the standards of the American Nurses Association.27 Each letter in the acronym corresponds to the essential nursing elements of perioperative patients. The PEARLS includes P (patient name, procedure performed, primary
Handover tools can help health care workers to accelerate the handover of postoperative patients in the PACU. High-quality handover tool is comprehensive and can be easily applied to the needs to be studied. The results showed that postoperative handover communication between clinical workers improved before and after implementation, and handover behavior was standardized. The PEARLS handover tool is comprehensive and can be easily applied to the handover of postoperative patients in the PACU. High-quality handover tools can help health care workers to accelerate the evaluation and rapid intervention of patients and significantly reduce the risk of rescue failure owing to a lack of critical handover information. PEARLS is appropriate for nonverbal handover. It should consider the timing of the writing process for handover personnel when using it. In addition, it has not been widely used, and its impact on the occurrence of adverse events in patients still needs to be studied.

<table>
<thead>
<tr>
<th>Tools</th>
<th>Contents</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBAR</td>
<td>Situation—Background—Assessment—Recommendation</td>
<td>1. The pattern is simple and easy to recall</td>
<td>For patients in the PACU, more relevant studies are needed to confirm the reliability of this pattern</td>
</tr>
<tr>
<td>iSoBAR</td>
<td>Identify—Situation—Observations—Background—Agreed plan—Read back</td>
<td>1. The handover person repeats the key handover content to ensure the handover is accurate</td>
<td>It is often part of the handover tool and has not been used alone</td>
</tr>
<tr>
<td>PEARLS</td>
<td>P (patient name, procedure performed, primary language, past medical history, position during surgery, precaution, personal items, and pain management), E (extremities, equipment needs, and elimination), A (assessment and antibiotic), R (relationships and radiology), L (laboratory due and lines), S (special devices, special needs, special communication needs, and surgical unit)</td>
<td>1. Covers basic patient information and surgery-related clinical information</td>
<td>1. Only applicable to nonverbal handover</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. It can help health care staff to identify high-risk surgical patients early, and quickly assess and intervene in response to problems</td>
<td>2. For patients with good general conditions, the application of this tool may increase the workload of nursing staff</td>
</tr>
<tr>
<td>COLD</td>
<td>Connect—Observe—Listen—Delegate</td>
<td>1. The entire process of handover is clearly covered</td>
<td>3. Handover information related to anesthesia risk is not covered</td>
</tr>
<tr>
<td>Visual handover nursing sign</td>
<td>The sign is printed with the number of the operation room, type of drainage tube, infection. Different contents of the visual handover nursing sign correspond to different colors</td>
<td>2. Provide separate handover time for health care workers to focus on avoiding missed handover</td>
<td>Whether doctors are willing to follow the handover process requires health care workers to reach an agreement</td>
</tr>
<tr>
<td>ABCDEFP</td>
<td>Airway—Breathing—Circulation—Disability—Exposure—Focus—Plan</td>
<td>1. Easy to remember</td>
<td>1. The sign cannot contain all important patient handover information</td>
</tr>
<tr>
<td>59-Item handover checklist</td>
<td>Preoperative (patient data, ASA, underlying diseases, allergies, medication, and anesthesia risks), intraoperative (a type of anesthesia, whether postoperative nausea and vomiting prophylaxis were administered, airway management, catheter insertion, hemodynamics, volume management, antibiotic therapy, type of surgery, anesthesia-related special occurrences, blood loss, drainages, and pain management during surgery) postoperative (postoperative information PACU and important particularities)</td>
<td>2. Handover of the patient’s intraoperative situation is comprehensive</td>
<td>2. The content is fixed and not suitable for some patients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Comprehensive information about perioperative anesthesia</td>
<td>3. Need to use other handover tools together</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Missing preoperative handover information</td>
</tr>
</tbody>
</table>

1. The sign cannot contain all important patient handover information. 2. For patients with good general conditions, the application of this tool may increase the workload of nursing staff. 3. Need to use other handover tools together. 4. Missing preoperative handover information.

Study results showed that postoperative handover communication between clinical workers improved before and after implementation, and handover behavior was standardized. The PEARLS handover tool is comprehensive and can be easily applied to the handover of postoperative patients in the PACU. High-quality handover tools can help health care workers to accelerate the evaluation and rapid intervention of patients and significantly reduce the risk of rescue failure owing to a lack of critical handover information. PEARLS is appropriate for nonverbal handover. It should consider the timing of the writing process for handover personnel when using it. In addition, it has not been widely used, and its impact on the occurrence of adverse events in patients still needs to be studied.

**Connect-Observe-Listen-Delegate Process**

Connect-Observe-Listen-Delegate (COLD) is a PACU handover process designed by Redley et al. COLD consists of four phases: Connect, the connection between the patient and monitoring; Observe, assess the patient’s condition and immediately take care of the patient to ensure their safety; Listen, learn information about the patient; and Delegate, determine who is responsible for the handover. The four phases of the clinical handover process may occur simultaneously or consecutively. This standardized process includes a detailed procedure and can enhance the quality of clinical PACU handover and comprehensively address the different perceptions between doctors and nurses regarding roles, accountabilities, and responsibilities during the transfer of patient care at PACU handover.

Health care workers often focus on monitoring the vital signs for patients transferred to the PACU, which prevents them from paying their full attention to the handover. Therefore, the clear handover process and carry out handover as an independent stage can enable...
medical workers to concentrate on the verbal handover and the transfer of nursing responsibilities without being disturbed by others. Each phase of the COLD handover process seems to be necessary and applicable to nurses. However, for physicians, the willingness to adopt and adhere to this handover process still requires further investigation. Moreover, the impact of the COLD handover process on patients needs to be evaluated.

Other Tools

Liu et al\textsuperscript{27} designed a visualized handover nursing sign for postoperative patients. The sign is printed with the number of the operation room, type of drainage tube, and infection. It is transferred into the PACU with the handover providers after the operation to remind the medical workers to pay attention to the important information. Studies have shown that the drainage tube slipping out, unplanned extraction, postoperative handover time, and nursing quality improved after implementation of the sign. A standardized nursing sign can offer a piece of warning information to nursing workers and help them grasp the patient's risk factors and nursing points.\textsuperscript{12} Different contents of the sign corresponding to different colors make it easy for medical workers to understand the medical risks of corresponding diseases, so that various preventive measures can be taken to reduce the occurrence of adverse events. Because of different attention information for PACU providers, the sign only contains part of the handover information. Therefore, the handover nursing sign can be developed according to the characteristics of the patient in different PACUs and can be used as a reference in combination with additional handover tools to increase patient handover quality.

Gao et al\textsuperscript{28} referenced the primary trauma assessment method ABCDE (airway, breathing, circulation, disability, exposure) and compiled the ABCDEFP (airway, breathing, circulation, disability, exposure, focus, and plan) handover list. Research has shown that the ABCDEFP can improve the efficiency and quality of patient handover, reduce the occurrence of adverse events, and enhance safety, which is worthy of clinical application.\textsuperscript{28} ABCDEFP handover mode is based on the primary trauma assessment (ABCD) method designed to prevent the medical risks caused by the handover and enabling nurses to grasp the comprehensive and systematic information in the shortest time. Compared with the SBAR, ABCDEFP pays more attention to patient information during the surgical process and does not include basic information and preoperative status of patients. Therefore, it should be used in conjunction with other handover tools.

Milby et al\textsuperscript{11} compiled a handover checklist with 59 items to record patient handover information. The contents of the checklist include three sections: preoperative (patient data, American Society of Anesthesiologists [ASA] classification, underlying diseases, allergies, medication, and anesthesia risks), intraoperative (type of anesthesia, whether postoperative nausea and vomiting prophylaxis were administered, airway management, catheter insertion, hemodynamics, volume management, antibiotic therapy, type of surgery, anesthesia-related special occurrences, blood loss, drains, and pain management during surgery), and postoperative (patient postoperative information when admitted to the PACU and important particularities). Research shows that in most cases, handovers in the PACU are incomplete, and it is necessary to optimize the postoperative handover process by implementing a standardized handover mode. Fifty-nine items contain information of various handovers of patients during the perioperative period. However, because of the ample handover information, it may take a long time for the handover workers. In addition, it is necessary to consider whether all items are applicable to all patients. Further study is essential to design a short handover checklist that can be based on the framework: preoperative, intraoperative, and postoperative.

Discussion

This article analyzed and compared several handover patterns for general anesthesia patients in the recovery period. There are several handover patterns for reference. Compared with other handover modes, SBAR is relatively mature and widely used. The iSoBAR handover tool is developed based on SBAR and has clarified who is responsible for the handover. However, it needs to be verified by more research and compared with the SBAR to select a more suitable PACU patient handover tool. PEARLS and 59-item handover checklists contain all kinds of patient information, which can help the health care workers to assess the patient's situation accurately and reduce the adverse events caused by the lack of handover information. The two tools mentioned are suitable for nonverbal handover, and the time consumed by handover providers should be taken into account. The structured handover tool is usually accompanied by a standardized process. For PACU nurses, the COLD handover process can clarify the work content of each phase of the handover and ensure that handover providers have independent handover time. Therefore, the standard handover process deserves our reference and further verification. Contents of ABCDEFP and visualized handover nursing sign are clear and practical but only contain part of the handover information. This pattern can be used as a reference and applied in combination with additional handover tools.

Handover is an interactive process between medical workers and plays a crucial role in determining the patient's future care plan. Nurses should choose or develop a handover model tailored to the patient's situation, work nature of the PACU, and characteristics of the environmental structure. The electronic information system can be used to apply patient handover information throughout the perioperative period. In addition, because of the rapid PACU turnover rate, the handover pattern should be simplified and easy to remember without omitting important information. It is important to remember that patients may have different handover patterns because of different surgical types, ages, countries, and hospital cultures, so these factors should be considered when selecting and developing the handover mode.

Conclusion

In summary, a standardized handover mode is an essential protocol for nurses to improve patient safety management and work efficiency. However, a standard should not replace all clinical nursing work. Comprehensive patient evaluation should also be based on professional judgment and clinical characteristics to ensure perioperative patient safety.

References


