

Improving Postoperative Handoff in a Surgical Intensive Care Unit

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BACKGROUND Evidence-based research demonstrates that postoperative formalized handoff improves communication and satisfaction among hospital staff members, leading to improved patient outcomes.

OBJECTIVE To improve postoperative patient safety in the surgical intensive care unit of a tertiary academic medical center.

METHODS A verbal and written formal reporting method was designed, implemented, and evaluated. The intervention created an admission “time-out,” allowing the handoff from surgical and anesthesia teams to the intensive care unit team and bedside nurses to occur in a more structured manner. Before and 1 year after implementation of the intervention, nurses completed surveys on the quality of postoperative handoff.

RESULTS After the intervention, the proportion of nurses who reported receiving handoff from the surgical team increased from 20% to 60% ($P < .001$). More nurses felt satisfied with the surgical handoff (46% before vs 74% after the intervention; $P < .001$), and more nurses frequently felt included in the handoff process (42% vs 74%; $P < .001$). Nurses perceived improved communication with surgical teams (93%), anesthesia teams (89%), and the intensive care unit team (94%), resulting in a perception of better patient care (88%).

CONCLUSION After implementation of a systematic multidisciplinary handoff process, surgical intensive care nurses reported improved frequency and completeness of the postoperative handoff process, resulting in a perception of better patient care. (*Critical Care Nurse*. 2019;39[5]:e13-e21)

Health care provider (HCP) handoff is a time when shortcomings in communication can result in patient harm, particularly in the postoperative period, when the patient’s physiology is changing rapidly. The Joint Commission has reported that two-thirds of sentinel events result from communication errors and that more than 50% of these sentinel events occur during HCP handoff.¹

Intensive care units (ICUs) have higher rates of adverse events due to medical error than other units, especially as a result of inadequate HCP handoff from the operating room to the ICU.² Intensive care unit patients are particularly vulnerable because of the need for invasive hemodynamic monitoring, administration of high-risk medications, and frequent performance of invasive procedures, all of which provide opportunities for error. For patients undergoing surgery, one study showed that almost 15% of postoperative adverse events were due to communication failures.³ Standardized checklist-driven

Communication errors are the most common root cause of sentinel events in the hospital environment.

handoff processes have been shown to improve the quality of information exchanged during handoff and to minimize extraneous diagnostic testing and procedures.⁴ Furthermore, handoff between HCPs can be an opportune time for teaching and clinical review.⁵ Precise communication among the teams is an essential part of keeping patients safe.

The University of Maryland Medical Center provides care to more than 7500 patients annually; many of these

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patients require a postoperative stay in an ICU. These surgical patients receive care from multiple subspecialties and are often managed by multiple services during their hospital stay, requiring multiple HCP handoffs that put them at risk for potential errors in care. Formalized HCP handoff ensures that information exchange is standardized and comprehensive so that the receiving specialists and surgical ICU (SICU) nurses can quickly move forward in providing individualized, high-quality, and safe patient care.

Rationale for Intervention

Health care provider handoff is a multidisciplinary, collaborative activity involving information transfer, sequenced tasks, and high-quality teamwork.⁶ Structured reporting tools, for both verbal and written communication, have been found to promote patient safety and improve the quality of HCP handoff.⁷ A comprehensive handoff allows for review of perioperative events and development of a shared understanding about expectations during the postoperative period, activities that promote a seamless and safe transition in care. Written handoff documents provide a formalized structure for verbal communication. These communication scripts can help teams avoid errors of omission and provide structure that allows HCPs to know when to expect what information. A huddle format emphasizing verbal communication permits ICU providers to ask questions and seek clarification so that an individualized, safe plan of care can be implemented immediately in the postoperative period. As noted by the Agency for Healthcare Research and Quality's TeamSTEPPS (Team Strategies & Tools to Enhance Performance & Patient Safety), teamwork is the key that can transform the culture of health care to focus on safety.⁸ A written report also allows subsequent caregivers to fully understand the patient's procedure and plan by documenting critical points of the verbal handoff.

Governmental bodies including The Joint Commission, the Agency for Healthcare Research and Quality, and the National Academy of Medicine have recommended developing a formalized HCP handoff process to improve both communication and patient safety. The Joint Commission reported that communication errors are the most common root cause of sentinel events, with HCP handoff being a significant contributor to these events. Additionally, in 2006 The Joint Commission

established National Patient Safety Goal 2E, which requires a standardized process for handoffs.¹ To target this communication issue, The Joint Commission developed the “Targeted Solutions Tool for Hand-off Communications,” known as SHARE. This tool describes specific guidelines for handoff with the goal of refining the hand-off procedure and improving the process of information sharing in order to prevent delays in treatment. Root-cause analyses were conducted by 10 leading US hospitals to develop these guidelines, which indicate that a well-conducted handover process includes the following: Standardization of critical content; Hardwiring within the hospital system through the use of standardized tools; Allowing for questions to be asked; Reinforcement of quality measures through clinical governance and audits; and Education and coaching for staff.⁹

Specific Aims

The collaborative quality improvement project described in this article was designed to formalize postoperative written and verbal communication among HCPs by means of a standardized handoff process intended to improve patient safety and team satisfaction with the reporting process. Evidence-based research demonstrates that formalized handoff after surgery improves communication and satisfaction among staff members, leading to improved patient outcomes. We hypothesized that implementation of this project would result in more positive perceptions among nurses of the handoff process and patient safety.

Methods

Context

The University of Maryland Medical Center is a 757-bed tertiary care facility serving the city of Baltimore and its surrounding communities. The hospital includes 11 ICUs, of which 1 is the SICU. The SICU is a 24-bed unit that admits critically ill (nontrauma) patients who have undergone or are expected to undergo single or multiple procedures, including general, acute care emergency, transplant, vascular, orthopedic, oncological, obstetric/gynecologic, otolaryngologic, thoracic, and oral surgery. The mean age of patients in the SICU is 58 years, with 58% being male and more than 50% of the patients having a chronic health condition.¹⁰

Surgical ICU patients are often admitted to the unit immediately after surgery. During a typical SICU stay,

a patient may travel between the ICU and the operating room (OR) multiple times over the course of days or weeks. Before implementation of the project, the anesthesia team accompanied the patient to the SICU after surgery and provided a verbal report and a copy of the intraoperative hemodynamics and medication administration report to the nurse. The surgical team’s involvement was much more variable. At times, no provider was present, or the provider present was not involved in the operation. The presence of a SICU physician, nurse practitioner, or physician assistant to receive report varied, as did involvement of the bedside nurse.

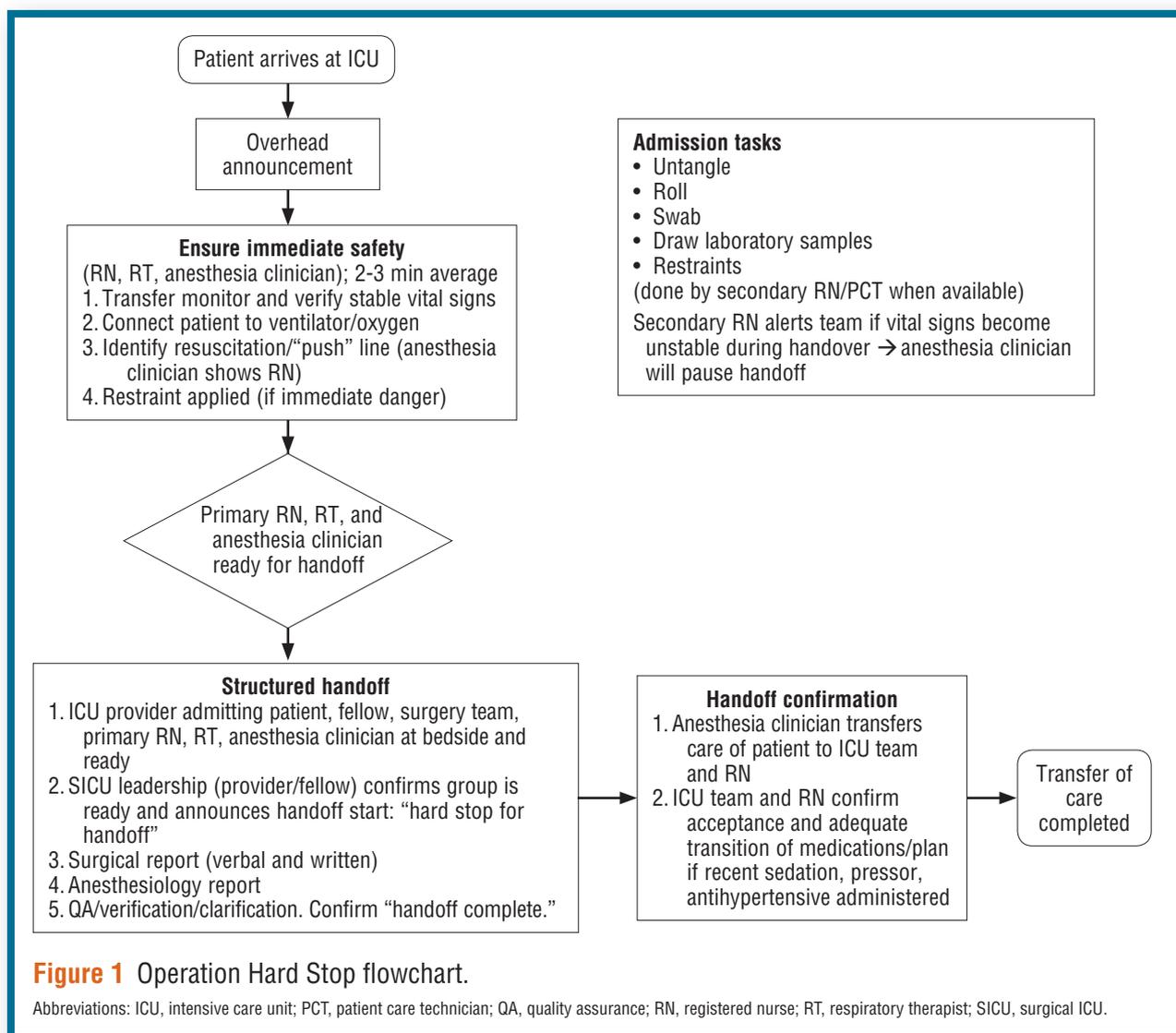
Intervention

The initial draft handoff tool was created and then piloted by a team of SICU nurses to improve surgical handoff. This effort led to an expanded quality improvement project and further development of the tool. Subsequent handoff tools were created by SICU nurse practitioners in partnership with the various surgical services. They included information such as diagnosis, procedure, drains, hemodynamic goals, type and frequency of nursing assessments, use of deep vein thrombosis prophylaxis and antibiotics, future operative plans, and diet status. The written handoff included an anatomical

drawing that **“Operation Hard Stop” was developed by a multidisciplinary group to formalize the postoperative written and verbal report process.**

could be used to identify specific bypasses, anastomoses, or drain locations. Report sheets were edited to create a standardized format across services. These report sheets were then reviewed by the remainder of the nurse practitioner group and the SICU medical director. The report sheet was piloted, feedback was collected from all involved personnel (including physicians, nurses, and nurse practitioners), and the report sheet was modified as necessary.

Concurrently, a multidisciplinary group including SICU fellows and attending physicians (both surgical and anesthesia), SICU nurses and leaders, and SICU nurse practitioners developed a formalized postoperative report process. The project was titled “Operation Hard Stop.” The process was mapped out on a flowchart and included a description of the roles of the bedside nurse, SICU provider, anesthesia team member, and



surgical team member (Figure 1). Signs that visually cued this new process were created and were posted in the patient's room upon the patient's arrival at the ICU from the OR (Figure 2).

Once the Operation Hard Stop process was created, education was provided to nurses via staff meetings, daily huddles, and email. Surgical and anesthesia residents were informed by email, direct communication from chiefs of the surgical services, SICU faculty, and a grand round presentation. In addition, the SICU medical director shared the report sheet with the SICU provider team. The intervention began in June 2015.

Evaluation of the Intervention

In order to evaluate nurses' perceptions of the intervention, we created preintervention and postintervention

surveys. Survey questions were developed on the basis of issues that were discussed by the multidisciplinary task force. This initial focus group identified concerns including the variation in reporting by anesthesia and surgical teams, the overall difference in reporting by the different surgical teams, inclusion of SICU providers and nurses, the amount of support that the primary nurse received from other nurses, the nurse's comfort in stepping away from the patient to receive a report, and the effect that years of nursing experience had on each of these issues. The survey items were reviewed by the multidisciplinary task force members.

The survey measured nurses' satisfaction with postoperative reporting by surgical and anesthesia team members before and after the intervention. The preintervention survey consisted of 13 items, and the postintervention



OPERATION HARD STOP

Excellent OR → ICU Handoff

- ICU provider at bedside
- Primary nurse ready for report
- Say “hard stop for handoff”
- Surgical report
(anatomy, drains, special instructions, handoff form complete)
- Anesthesiology report
(airway, lines, fluids, resuscitation, handoff form complete)
- Confirm “handoff complete”

Figure 2 Operation Hard Stop bedside sign.

Abbreviations: ICU, intensive care unit; OR, operating room.

survey consisted of 15 items. The first 7 items compared reporting procedures of the surgical and anesthesia teams. The next 4 items asked about the prioritization of activities upon the patient's return from the OR. The last 2

questions asked about years of nursing experience. The 2 additional items in the postintervention survey focused on nurses' perception of the impact of the intervention on the reporting process.

Table 1 Comparison of nurses' perceptions of factors in handoff from surgical and anesthesia teams before and after the intervention

Factor	From surgical team			From anesthesia team		
	Before, % of respondents	After, % of respondents	P	Before, % of respondents	After, % of respondents	P
Received handoff upon patient's return from operating room	20	60	<.001	78	88	.11
Satisfied with handoff	46	74	<.001	88	91	.59
Perceived handoff as important	84	88	.46	88	87	.80
Can identify providers	15	47	<.001	67	70	.75

Table 2 Comparison of nurses' overall perceptions before and after the intervention

Perception	Before, % of respondents	After, % of respondents	P
Frequently feeling included in the handoff	42	74	<.001
Frequently feeling like all questions were answered	65	77	.12
Feeling comfortable speaking up	72	77	.55
Frequently feeling too busy with <i>routine</i> activities to stop and participate in handoff	32	12	.004
Frequently feeling too busy with <i>urgent</i> activities to stop and participate in handoff	26	11	.002

The survey was administered in a paper format to all staff nurses in the SICU during all shifts. The preintervention survey was administered in May 2015, and the postintervention survey was administered in May 2016. A confidential numerical code was maintained by the project coordinators to link preintervention and postintervention surveys.

Analysis

Data analysis was conducted using Microsoft Excel for Windows. The data were validated using double data entry. Descriptive statistics were created for each item. Eleven items used different variations of Likert scales, and 2 demographic questions included 7 different time options; dichotomous groups were then created for each of these items. Another 2 items were answered as yes/no. All of the questions were then evaluated as dichotomous variables comparing the preintervention and postintervention data using the χ^2 test for unpaired data. Analysis was not completed on paired data.

Ethical Considerations

The study was reviewed by the University of Maryland, Baltimore, institutional review board. The intervention, which was undertaken primarily as a quality improvement project, was deemed a non-human-research study. Although a census of all nurses employed by the

SICU was obtained from the nurse manager to assess response rate, participation in the survey was voluntary. The master list of staff nurses with their corresponding identifiers was available to only 2 survey administrators and kept in a locked file. Every attempt was made to keep the responses confidential.

Results

Before the intervention, there were 74 staff nurses in the SICU, of whom 93% participated in the survey. After the intervention, there were 86 staff nurses in the SICU, of whom 79% participated in the survey. The 2 groups had similar proportions of nurses with less than 2 years of experience (22% before vs 24% after) and nurses with 2 or more years of experience (78% vs 76%).

The survey evaluated nurses' perceptions of the handoff process before and after the intervention (Tables 1 and 2). A statistically significant increase was found after the intervention in the percentage of respondents reporting receiving handoff from the surgical team on the patient's return from the OR (20% before vs 60% after; $P < .001$). A statistically significant increase was also found after the intervention in the percentage of respondents reporting being satisfied with surgical handoff (46% vs 74%; $P = .001$). No statistically significant difference was found in the percentage of respondents reporting receiving handoff from the anesthesia team (78%

before vs 88% after; $P = .11$) or the percentage reporting being satisfied with the anesthesia team's handoff (88% vs 91%; $P = .59$). After the intervention, nurses were more likely to report frequently feeling included in the handoff (42% before vs 74% after; $P < .001$) and were less likely to report frequently feeling too busy with their activities to stop and participate in handoff.

The postintervention survey included several additional questions about the implementation of the formalized handoff. Seventy-two percent of the respondents reported that the formalized handoff was attempted frequently. Nurses reported satisfaction with the intervention, including perceived improved patient care (88%) and communication with surgical teams (93%), the anesthesia team (89%), and the ICU team (94%).

Discussion

Evidence-based research has shown that a formalized handoff process improves both communication and patient safety, and this concept is supported by national governmental bodies.¹ The results of our survey of nurses indicate that implementation of a quality improvement project enhanced the quantity and quality of HCP handoffs in our SICU. Recent research on patient safety culture in hospitals indicated that behaviors, attitudes, and perceptions are interconnected, suggesting that improving perceptions of communication during handoffs will result in positive behavioral changes. These behavioral changes, in turn, may lead to improved patient safety.¹¹

Interpretation

A recent systematic review of HCP handoffs by Segall et al¹² addressed whether postoperative patient handoffs have been found to improve patient safety. The authors found an association between poor-quality handoffs and adverse events but indicated that more research was needed to identify ways to improve the handoff process and determine its effects. In addition, the authors noted that most studies in this area focus on pediatric patients undergoing cardiac surgery and thus typically involve small clinical teams and patients with a high level of acuity. In contrast, our study was conducted in an adult mixed SICU; thus, given that adult ICUs outnumber pediatric units, our study is likely to be generalizable to a larger patient population.

The literature includes several articles on postoperative patient handoff in adult mixed ICUs. One study

from 2016 featured the same Plan-Do-Study-Act framework as used in this study, but the researchers used direct observation and focus groups instead of anonymous surveys to evaluate the results.¹³ They concluded that they

... were unable to examine the effects of the [handover] redesign process on patient outcomes. However, improved team behaviors, reduced workload, and improved staff satisfaction ... have all been linked to improved quality of care and patient outcomes in other care settings.^{13(p408)}

Despite the differing study methodologies, the fact that their study and our study reached similar conclusions suggests that the findings are reproducible.

Our findings are also consistent with those of a recent study by Lane-Fall et al¹⁴ that examined facilitating factors and barriers related to the consistent practice of handoff. The authors reported that facilitating factors included prearrival notification, provider familiarity with the patient, and physical presence of clinicians in the patient's room. Barriers included being rushed, lack of provider

availability, and competing priorities.¹⁴ **The factors that most contribute to patient safety are leadership support, communication, and teamwork.**

In our study, we found that nurses were less likely to report feeling too busy to stop for participation in handoff after the intervention. This outcome supports the findings of Lane-Fall et al¹⁴ that implementation of a formalized handoff process can address some of the barriers to the consistent practice of handoff.

Human factors science and engineering may help explain the success of the new handoff process in our SICU. Training on how to perform postoperative handoff by itself is unlikely to have changed behaviors and improved patient safety. According to human factors science, problems are fixed not by teaching people how to modify their behaviors but rather by modifying the design of the system to better aid people.¹⁵ The intervention changed the system by creating a new structure for the postoperative handoff. Roles were assigned, tools were created, and visual cues were provided that redesigned the framework in which postoperative handoff occurred.

Human factors engineering is concerned with the interaction between people and their environment and how changes in this interaction can contribute to improvements in performance, safety, and quality.¹⁶ Operation Hard Stop changed the organizational culture and climate surrounding patient safety. For instance, after the intervention, the nurses were more likely to report feeling included in the handoff process and able to stop performing their routine or urgent activities in order to participate in handoff. Thus, the organizational culture had changed to allow nurses to feel that they could participate and that their participation was valued.

A consensus has emerged that although many facility-driven factors can affect culture change, the factors that most contribute to patient safety are leadership support, communication, and teamwork.¹⁷ In our institution, it is unlikely that change would have occurred without the buy-in of all members of the multidisciplinary group and their persistence in working toward a culture change regarding what was expected postoperatively. Thus, replication of this intervention at other sites should take a multidisciplinary approach to design and implementation in order to have the best chance of success.

Limitations

The culture in the SICU at our institution was conducive to the success of Operation Hard Stop. However, the current cultures at other institutions may limit the amount of change in behaviors and patient safety that can be achieved. Moreover, the need for change may vary. For example, in our study the anesthesia team results did not show significant improvement because the nurses were already satisfied with the handoff from this team before the intervention, whereas the surgical team handoff had more room for improvement.

In evaluating the results of the intervention, this study focused on the perceptions of nurses, without taking into account the impressions of the other members of the multidisciplinary group. Given that our SICU includes only 7 nurse practitioners and that they conducted the survey, it is possible that the results reflect bias toward the success of the initiative. We focused on measuring the perceptions of nurses rather than physicians in part because in an academic medical center, physician trainees come and go on a monthly basis, whereas the nursing staff is relatively consistent over time.

The strength of buy-in from each group in the multidisciplinary team will also affect the impact of the change. In our SICU, the nurses and nurse practitioners became important catalysts in the culture change. Their high level of buy-in, physical presence on the unit, and continuity over time increased the impact of the intervention, promoting the initiative's success.

Another factor that may affect the ability to change the culture of a unit is the amount of staff experience. The specific impact of more or less experience on satisfaction with a new handoff process is unclear. On the one hand, a nurse with less experience might be more amenable to a change in culture because of greater flexibility and openness to different approaches to providing care. On the other hand, a more experienced nurse might have a greater investment in the unit and therefore be more committed to practice improvements. In our study, we did not find statistically significant differences in nurse perceptions of handoff by years of experience, but the small sample size may have affected this result.

Although the results of our study indicate a perceived improvement in patient safety, this is only a perception: we did not collect patient outcome data, such as number of days receiving mechanical ventilation, length of stay, or mortality rate. Even if these data were collected, it would be difficult to determine whether any improvements in outcomes were due solely to the intervention.

For the first 2 months of the intervention, an audit was conducted to ensure adherence to the formalized postoperative handoff process. The unit clerks completed a daily log that listed each incident of a patient's return from the OR and whether a written handoff record was found in the bedside chart. Reeducation was provided whenever possible. No cumulative data were collected on adherence to the process or on nurse perceptions of the intervention at that time. Such process outcome data could have provided another helpful perspective on potential barriers to the intervention's success.

As the use of a formalized postoperative handoff process expands to other locations in the hospital, future evaluations of the effectiveness of the intervention may include direct observation of the verbal handoffs or an audit of the written handoff tool. Such measures could help determine the amount of change in the verbal and written handoff before and after the intervention. Examining patient outcome data is an especially important task for future assessment. All of these

evaluation techniques will require more time and personnel to support project expansion.

Conclusion

Patient safety depends on the effective coordination of care between the multidisciplinary HCP teams. The implementation of a formalized HCP handoff process increases nurses' perception of safety and improves the transmission of information between HCPs. Well-designed handoffs that ensure good team communication and individualized patient management are supported by evidence-based research and should become the standard of care. [CCN](#)

Financial Disclosures
None reported.



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See also

To learn more communication in the critical care setting, read "Improving Communication Between Surgery and Critical Care Teams: Beyond the Handover" by Turner et al in the *American Journal of Critical Care*, September 2018;27:392-397. Available at www.ajcconline.org.

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