

The pitfalls of postoperative theatre to intensive care unit handovers: a review of the current literature

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Postoperative handovers present a critical step in the management of intensive care unit (ICU) patients. There are many challenges in the transportation of unstable patients with complex medical histories from theatre to the ICU, and the subsequent transfer of responsibility for care from one group of caregivers to another. Communication between the providers of the handover report (anaesthetists, surgeons and theatre nursing staff) and receivers of the report (ICU physicians and ICU nursing staff) is often poor. The unstructured presentation of information, the noisy ICU environment, and discussions between healthcare workers from different disciplines at different levels of training adds to the burden of communication. The handover report may be seen as a sentinel event in the ICU patient's stay. ICU staff use the handover process as an important source of information to coordinate management input from multiple disciplines. Despite its importance, the practice of a structured postoperative handover protocol in our region's hospitals is non-existent. The authors reviewed the current literature to better understand the challenges facing proper handover processes and suggest some interventional strategies.

Introduction

Patients are at their most vulnerable in the postoperative environment. This is reflected in the many adverse incidents that occur during this time.¹ This critical period in patient care is characterised by downscaled monitoring and observation, the transfer of potentially unstable patients from theatre to the intensive care unit (ICU), and the transfer of responsibility for care from one group of caregivers to another.^{1,2} This process, and the transfer of relevant information, characterises the essence of a postoperative handover. As an example, cardiac surgery patients are at even higher risk during this phase of their management. The physiological milieu post-cardiopulmonary bypass, lends itself to rapid haemodynamic changes with vulnerable myocardium and multi-organ involvement.^{2,3} Cardiac patients often present with complex medical and surgical histories that require careful consideration during the postoperative handover. The accurate communication of intraoperative events is critical in optimising their postoperative ICU management.³

For these reasons, it is important to enhance the information exchange during the postoperative handover from the theatre team to the ICU team. Unfortunately, the communication between the providers and receivers of handover reports is poor. This is owing to the unstructured presentation of information, the noisy ICU environment while dealing with unstable patients, and discussions between healthcare workers from different disciplines who function at different levels of training.⁴ Poor communication potentially compromises ICU patients' management, and in addition, may lead to misinterpretation or delayed special investigations and drug errors.^{4,5} Communication failure is the primary cause of adverse incidents in the postoperative environment. Postoperative handovers are often perceived to be hazardous and fragmented.⁶⁻⁸ Despite the importance of adequately managing the postoperative period and handover as an integral part of patients' in-hospital treatment, few initiatives exist in the South African context to improve and facilitate this communication process.

Literature search strategy and quality criteria

A Medline search was completed via the PubMed search engine. Keywords included "handovers", "postoperative", "intensive care unit" and "cardiac". Reviews and original research were included. Articles that discussed training methodology and study methods relating to handovers in the postoperative period, and which included intensive care units, were also included. Numerous studies have explored the role of nursing staff in managing handovers in the ward, emergency room and ICU.⁹⁻¹³ Other studies have focused on the handover process in daily ward rounds, or the sign-out process between physicians and other healthcare providers.¹²⁻¹⁶ These studies were included in this study since the focus of the handover and environment during the daily ward round contains valuable communication insight into an environment which is analogous to the postoperative handover. Twelve articles were selected to represent the current available literature on postoperative handovers in the ICU. The included articles consist of two review articles and 10 original research articles.

Interpretation of literature

Definition

Postoperative handovers have been defined as the period during which the patient leaves the operating room and arrives at a post-procedural destination.¹ Abraham et al expanded the handover definition to include the transfer of information, responsibility and authority.¹⁷ The American Joint Commission on Handover Communication states that handovers are contemporaneous interactive processes of passing patient-specific information from one caregiver to another for the purpose of ensuring the continuity and safety of patient care.^{2,5,18} Handovers can be further defined to include the transfer of technology and equipment.³

Background

In 2007, Catchpole et al published an article on postoperative handovers set in the paediatric cardiac ICU in the Great Ormond Street Hospital for Children in London.¹⁹ This study describes the complexity of the postoperative handover in terms of

systems implemented in two high reliability industries; the aviation industry and the pit stop in Formula 1 racing. These two industries share similarities with the ICU milieu as multi-professional teams have to perform as a single unit under pressure, with little room for error.¹⁹ After visiting Ferrari's headquarters in Maranello, and observing the safety themes and analogues of the pit stop environment, the newly designed handover protocol was augmented by suggestions from airline pilots, thus combining efficiency with safety.

Some of the safety themes taken from both industries which helped to develop the new protocol included:

- Clearly defined leadership roles.
- A structured three-phase handover.
- Failure modes and effects analysis, and identification of high-risk areas.
- Discipline and composure, i.e. minimal interruptions and parallel conversations during handover.
- Checklists.
- Involvement (all team members are encouraged to contribute).
- Situational awareness.

After implementing a prospective interventional study based on the newly developed handover protocol, Catchpole et al demonstrated a reduction in technical errors, handover omissions and improved efficiency.¹⁹ Li et al¹⁵ and Jayaswal et al²⁰ independently made reference to the National Aeronautic and Space Administration and nuclear power plants as two industries that make use of specialised handover protocols to improve communication.

Duke Children's Hospital took a different approach, and applied the manufacturing industry's Six Sigma[®] methodology, used in the Toyota production system, to communication systems.⁸ The Six Sigma[®] methodology follows a data-driven approach that aims to improve system capabilities and decrease variability.⁸ Both approaches view a system as "a set of interdependent elements acting towards a common goal".⁸

The independent elements consist of five steps, abbreviated as "DMAIC":

- *Define*: Identify integral elements of a process and steps that are deemed to be "critical to quality".
- *Measure*: Identify measurable outcomes that provide a baseline performance standard against which future changes can be measured.
- *Analyse*: Pinpoint areas of high variability and identify potential causes for this.
- *Improvement*: Create solutions to decrease variability and bridge critical gaps.
- *Control*: Invest in efforts that encourage the sustainability of interventions.

A prospective interventional study in the paediatric cardiac ICU of this tertiary level hospital showed a reduction in handover turnaround time, reduced time in obtaining critical laboratory results, and an increased number of completed chest radiographs. Mistry et al also refers to the aviation industry by applying the "sterile cockpit" principle during the intervention. This refers to the locking of the aircraft cockpit during takeoff and landing to minimise interruptions. Utilising the "sterile cockpit" during handovers aims to minimise interruptions during the handover period and encourage only patient-specific conversations.^{8,19}

Why are good handovers important?

Communication failure has been cited as causing up to 70% of adverse events in the healthcare industry.¹⁷ Handovers between care providers account for half of these errors.¹⁷ Poor handovers may also lead to treatment delays and lag time in the ordering of tests.¹⁷ This may lead to increased morbidity and mortality, as well as increased length of patient stay, with consequent monetary implications. The American Joint Commission report identifies communication errors as the leading cause of anaesthesia-related adverse incidents.²⁰ In their survey of anaesthesia staff, 20% perceived the handover process to be inadequate. Most reported giving and receiving poor or incomplete handovers in the past year, and 25% identified an adverse outcome due to a poor handover.²⁰

Suboptimal handovers are major contributing factors to adverse events. Wayne et al⁵ and Li et al¹⁵ describe how communication barriers contribute to this. Li, Stelfox and Ghali specifically identify the ICU as an error-prone communication environment owing to the complexity of patients being transferred.¹⁵ Carrol et al describe video-reflexive ethnography training as a means of overcoming this complex labyrinth of speech.¹³ In this study, poor communication was listed as the number one cause that negatively impacted on patient safety. Since risk severity correlates with the amount of time patients spend in the hospital, poor communication, leading to a prolonged in-patient stay, further subjects patients to adverse events.¹³ Møller et al conducted a systematic review of postoperative handovers, which included 23 studies. They reported that 14% of postoperative clinical incidents occurred during the postoperative handover.¹

Agarwal et al studied handovers in the paediatric cardiac ICU. The breakdown in communication during handovers between the anaesthetist, cardiac surgeon and paediatric intensivist caused major adverse events.⁴ These patients were at their most vulnerable during the immediate postoperative phase of their treatment. Agarwal et al studied the effect of a structured handover protocol on patient complications and outcomes in the first 24 hours post surgery. The implemented protocol led to a significant reduction in the loss of information and a decrease in major complications. The number of early extubations also increased.⁴

Chen et al reported on communication errors in 100% of handovers, with a staggering number of 6.6 errors per handover.¹⁸

The frequently quoted report, *To err is human: building a safer health system*, by The Institute of Medicine, suggests that preventable medical errors may cause 98 000 deaths each year in the USA.¹² The authors of this report make a statement on individual responsibility within error-prone environments: "Although an individual clinician might be the proximal cause of an adverse event, organisational factors can create the circumstances in which a failure of judgement occurs".²¹ ICUs, operating rooms and emergency departments experience higher rates of medical errors.⁸

Mistry et al list four reasons why the handover process is critical:⁸

- Patients are clinically unstable and may require urgent intervention.
- Time to review the medical record prior to these critical interventions is limited.

- ICU staff has limited knowledge of the patient's medical history, and use the handover process as a key source of information.
- Coordinated management by multiple disciplines is enhanced during the handover process.

What are the causes of communication failure during handovers?

Conversation analysis of audio recordings during ICU handovers revealed two forms of conversation: variations of soliloquy (monologue) and colloquy (dialogue).¹⁴ Kowalsky, Nemeth, Brandwijk and Cook indicated that the presumed correlation between handover time and care demand was false. Uncertainty about a patient's condition, rather than the complexity of the condition, influences handover content and form.¹⁴

Authority relationships with apical hierarchies also make information sharing difficult.¹³ Since information exchange in medicine is based on verbal communication subjected to group dynamics in many instances, apical hierarchies may derail attempts to create the better information sharing found within egalitarian teams.¹⁹ Carroll, Ledema and Kerridge point out that ambiguous information that is poorly integrated into team-based decision-making processes may eventually be lost.¹³

Wayne highlights the counterproductive habit of attempting to limit medical errors by limiting handovers.⁵ Realising that more handovers can lead to more medical errors, some units attempted to decrease the amount of handovers performed by increasing the working hours.⁵ Wayne et al point out that this practice was insufficient in addressing the problem of poor handovers, and could only be applied in the era of unregulated working hours. In this study, the variability of the handover process led to uncertainty about the required content and structure.⁵ Jayaswal et al state that handovers that were standardised led to loss of information.²⁰

Mistry et al identify three causes that negatively affect the handover process:⁸

- The absence of doctors who supervise patient care in the immediate pre-handover phase.
- Variations in the structure and content of the handover process.
- Healthcare workers being distracted during the handover process, or the handover being interrupted.

The use of checklists can be viewed as an easy solution to this complex problem. However, long checklists may negatively influence their own function since there is a tendency to perform other tasks while reading the checklist, in an effort to increase productivity.⁸ Giving structure to information does not necessarily make information useful. The use of checklists may not ensure that all of the members of a healthcare team understand a patient's condition or management plan.⁸ The completion of checklists at the end of a shift has also been shown to be prone to error, as well as incomplete. This finding correlates well with research that was carried out in the aviation industry.⁸

Information that is verbally communicated is not always heard or understood if the environment is unsuitable for information exchange at that time. The environment plays a key role in the success of a handover. There are many distractions in a busy ICU which makes any handover a challenging task.¹⁸ Handovers during visiting hours, parallel conversations and interruptions

further burden this information exchange. Abraham et al identified some of the reasons behind communication that tends to fail.¹⁷ These include lack of face-to-face communication and illegible clinical notes. In countries such as South Africa, where healthcare workers from different cultural backgrounds speak numerous different languages, the handover process may be especially strained.¹⁵ Handovers which are attended by multidisciplinary teams may also suffer owing to differences in clinical focus, as well as increase the risk of adverse events occurring.²¹

Potential strategies for intervention

The implementation of a standardised handover template has been shown to provide the best scenario for optimal information sharing.^{4,17} It allows for relevant information to be discussed, and focuses on desired patient outcomes. Jayaswal et al reported that 89% of study participants who were interviewed felt that standardisation would improve patient care.²⁰ Standardisation overcomes the lack of communication skills of many healthcare workers.²⁰ It prompts verbal communication and feeds into the collective information push model.¹⁷ Information is sent to users without them having to ask for the relevant information, as opposed to information pull models whereby users have to know which information to extract. Verbalised handover protocols also enhance face-to-face communication, which has been shown to be the most effective method of information sharing.¹⁵ Many authors promote the use of an electronic patient record to capture and communicate handovers.²⁰ This may be a useful tool in facilities where these resources are used. However, it can never replace the value that face-to-face communication plays in social interaction and the added dynamic of teamwork during group interaction.

Interventional strategies will only succeed if there is willingness on the part of team members to participate as a group.¹³ It may require a shift in authority relationships from apical hierarchies to egalitarian teams, where information is integrated in a team-based decision-making process.¹³ Many private organisations employ the term "change management" to better engage with employees about their anxiety about a change in their working environment. Since the implementation of a newly designed protocol challenges many entrenched roles, it is important for users to be able to see the importance of that change.¹ Training is key to change management, and should be an integral part of any intervention strategy. The retention of plasticity in any intervention ensures that the handover protocol is moulded to function in a wide variety of scenarios, e.g. absent team members, or a haemodynamically unstable patient who arrests on arrival in ICU. Chen et al made reference to the importance of a user-centered innovation that would ensure the commitment of all team members. Users also have a better understanding of their deficiencies.¹⁸ Plasticity and user-centered innovation should never undermine the specific outcomes of a standardised handover protocol.

Møller, Madsen, Fuhrmann and Østergaard discussed five concepts in the formulation of a framework for handover improvement, as proposed by Botti et al:^{1,22}

- *Clinical governance*: Regular meetings with a focus on support by unit managers and leadership by senior executives.
- *Clinical engagement*: Participation in data collection and interviews that build capacity and stakeholder involvement.
- *Ecological validity*: Understanding the impact of the environment, clinician perceptions and contextual influences on handover outcome.

- *Safety culture and team climate*: The use of questionnaires and focused interviews to understand the team “climate”, stress recognition and job satisfaction.
- *Sustainability*: The development of strategies and tools to monitor the handovers.

Without a sustainable solution to handover improvement, intervention is not possible.¹ Mistry et al refers to high reliability industries’ team training concepts as being integral to handover success. These include teamwork, communication techniques, the flattening of hierarchy, mutual respect and situational awareness.⁸ This creates a “shared mental model” of a patient’s care and the expected clinical trajectory.

Suggestions for future research

The search for an improved method of conducting postoperative handovers will have to include a wider view in order to understand the current resistance and inability to conduct proper handovers. Future research and interventions will need to focus on motivating staff to attend handover training. Staff may be more compliant and willing to participate following an understanding of the challenges of time management, such as surgeons writing operation notes, and finding novel ways to speed up the process. The manner in which qualitative research is conducted directly affects the conduct of the staff being audited. Future research may have to rely on live video to capture the intricacies of the handover process, and try to depict audible as well as visual cues that identify further challenges to the handover process. Patient confidentiality and privacy in the unit may retard such attempts, and will have to be considered.¹³ The use of checklists to audit the quality of the information exchange may have to be replaced with more elaborate data-capturing tools to allow for wider interpretation than that permitted by a checklist.²

In an era of evidence-based medicine in which clinicians react to risk ratios, *p*-values and 95% confidence intervals, a large randomised control trial may need to be conducted to show whether or not enhanced communication in the handover process would lead to improved patient outcome. Obvious challenges to a large randomised controlled trial would be the large number of cases needed to prove the null hypothesis. Inter-observer variation and different cultural, linguistic and workload environments might interfere with the transfer of data between these units. The use of quality improvement initiatives and patient care bundles to decrease patient harm has been shown to be very efficient. By focusing on the handover process as one of the most important communicative processes of a patient’s ICU stay, we will draw closer to completing the circle of improved patient care.⁸

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