Observation of handover process in an intensive care unit (ICU): barriers and quality improvement strategy

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Abstract

Objective: To describe the characteristics and barriers in the handover process in a medical intensive care unit.

Design: A cross-sectional descriptive study using a checklist to observe nurses and doctors during handover of patients in and out of the intensive care unit.

Setting: The study was conducted at a 1000-bed tertiary hospital in Singapore. The unit admits all patients under university medicine clusters, except those needing cardiology services.

Participants: Handover between 90 pairs (180 participants)—50 nurse-to-nurse (100 nurses) and 40 doctor-to-doctor (80 doctors)—were passively observed in real time during morning and evening shifts over weekdays.

Main Outcome Measures: The number and types of distractions and their relationship to the time spent during handover, the information included during handover, and the number of working shifts.

Results: The results showed that there were 1.26 (±1.75) distractions per handover. In 45 (50%) handovers, no distraction occurred. The human factor was the most common distracting factor during handovers, whereas short message service and monitor alarms were not identified as distracting factors. The information included least often was ‘do not resuscitate’ (DNR). Nurses spent significantly longer during handovers than doctors.

Conclusion: The findings provide information for improving the handover process during the transfer of patients in and out of the intensive care unit. Distractions during handovers are common and are associated with longer durations. Nurses and doctors rarely address DNR status during handover of ICU patients in this study.

Key words: quality improvement, quality management, intensive care, setting of care
Introduction

Identifying high-risk situations for patient safety helps healthcare providers focus on enhancing quality of care. One high-risk area for patient safety is patient handover, which is a process of transferring patients’ clinical data to another person or professional group and can occur at the staff break time, during shift changes, and when patients are transferred in and out of the units and departments within and outside hospitals [1]. Breakdown of communication is the leading cause of medical errors and sentinel events [2]. Many previous studies have shown that ineffective communication during handovers has led to medical errors [3–5]. Li et al. [6] also found that a poor handover process was a significant contributor to medical error in intensive care units. Since the Joint Commission released a National Patient Safety Goal aimed at improving communication, health care organizations have urged improved communication during patient handover [7]. It is imperative that handover processes are improved to prevent medical errors and improve patient safety and quality of care.

The Australian Commission on Safety and Quality in Health Care has evaluated the handover process after implementing the handover guidelines [8]. They found that distractions during handover were related to ineffective communication and additional time spent on handovers. Regular distractions such as telephone alerts, approaching of patients’ relatives and medical staff interrupting increase the length of handovers and result in important information not being passed on effectively [5]. A study by Currie [9] also reported that the longer handover time has led to lower attention spans of both reporting and receiving staff during handovers. During transfer of patients, information regarding tests undertaken and treatment or care received is transferred between healthcare providers to formulate a plan for continued care [6]. To ensure patient safety, the barriers to and the nature of the handover in each context must be identified and evaluated to enhance the quality of the handover process.

Many studies have investigated the success factors and outcomes of effective handover and are mainly interview based [10, 11]. The results of those studies have shown that effective handover improves communication and patient satisfaction. Because direct observation of the handover process is labour intensive, only a few studies have addressed specific factors or situations that occur, such as people interrupting each other, distractions, inadequate time allowed, limited communication methods, and failures to communicate or understand the significance of data or events [5, 6]. The focus of those studies carried out was on shift-change reports and patient transfer in the general ward. Data in the critical care setting are sparse [6].

Patient transfer in and out of ICUs is more complex due to their condition and the need for intensive monitoring [6]. Patient transfer has been recognized as an area facing more communication problems due to cultural differences, work-load challenges and differences in clinical specialties [3, 12]. Hence, effective handover of ICU patients is even more complex than handover during shift changes or at the bedside on the general wards. In our medical ICU (MICU), senior staff have observed the handover process and found that taking calls and interrupting the conversation during handovers led to instances where important patient information was missed, which later jeopardized patient safety. According to the literature and our observations, concern over safe handover has been brought to the attention of the hospital administrators and healthcare providers. As a result, a quality improvement (QI) team at the MICU was formed to describe the handover process and initiate a strategy to enhance the process in ICUs (PDSA cycle). The QI project adopted two methods: it used the post-handover survey of the healthcare professional involved and a structured direct observational method. The survey method was used to identify the differences in practices and perceptions of handovers between nurses and residents in the critical care setting, thereby improving the process by mutual learning. The results of the survey have already been published [13]. For this paper, we reported the results of the structured observational method, which aimed to identify the types of distractions and factors relating to distractions (duration, time and people involved) during handovers of patients being transferred in and out of MICU, to enhance patient safety and quality of care.

The specific objectives of this initiative were as follows:

(i) To identify the types of distractions, documentation, tools and information that were included during handovers of patients being transferred in and out of the MICU.

(ii) To differentiate the time spent and the number of distractions between nurse-to-nurse and doctor-to-doctor handovers of patients transferred in and out of the MICU.

(iii) To differentiate the time spent and number of distractions between day shifts and evening shifts during handovers of patients transferred in and out of the MICU.

(iv) To identify the relationships between time spent and the number of distractions during handovers of patients transferred in and out of the MICU.

Methods

Design and setting

A cross-sectional descriptive study design was adopted using a checklist to observe nurses and doctors in real time during handovers of patients being transferred in and out of the MICU. The data were collected in a 12-bed MICU, at a 1000-bed tertiary hospital in Singapore. The unit admits all patients under university medicine clusters, including haematology-oncology, except those needing cardiology services. Patients are admitted from the emergency medicine department, acute hospital wards and other units within the hospital. During the 1-month period of our study, 168 patients were transferred in and out of the MICU (95 patients were transferred in and 73 patients were transferred out).

Sample

The participants in the study were doctors and nurses involved in handovers. The reports were received and given either nurse to nurse or doctor to doctor. In the study, a total of 90 pairs (180 participants)—50 nurse-to-nurse pairs (100 nurses) and 40 doctor-to-doctor pairs (80 doctors)—were observed in real time during handovers. The observation of handovers covered 53.6% (90 of 168) of the patients transferred in and out of the MICU in June 2012.

Instruments

The checklist for observation was developed based on the OSSIE Guide to Clinical Handover Improvement [6]. The checklist included the location, parties involved, duration (recorded by stopwatch), distractions (phones, people, SMS, alarms and others), tools used [checklists, handover sheets, reading back, records of results or reports (paper or digital) and others], patient information and aspects of patient management covered (e.g. ‘do not resuscitate or intubate’ orders). An expert panel reviewed the checklist to assess the appropriateness of its contents.
Data collection

The study was reviewed by the National Health Group (NHG) Domain Specific Review Board (DSRB) and was exempted as QI project (NHG DSRB 2012/00957). Five QI team members attended four 1-hour training sessions prior to the data collection. Mock observations were carried out during the last sessions. All conceivable scenarios were discussed, and confusions were resolved through mutual decisions. The QI team members informed participants of the purpose of the study and obtained verbal permission from nurses and doctors prior to the observations. This procedure might have led to reactivity or behavioural distortions, whereby the participants changed their behaviour because of the known presence of observers [14]. To minimize the reactivity (the Hawthorne Effect), the participants were not told the components of the checklist or what would be observed during handover, only the purpose of the study in general. Some variables, such as types of distractions during handover and time spent, were observed independently and could not be changed or controlled by the participants. Handovers were passively observed in real time from a distance of ~1 m in the MICU and wards (where patients are transferred following MICU discharge) during morning shifts (8.00 am to 4.00 pm) and evening shifts (4.00–11.00 pm) on weekdays.

Data analysis

Statistical software (IBM SPSS version 22.0) was used to analyse the data. Statistical significance for all analysis was defined as $P \leq 0.05$. Data screening was performed for missing data and outliers. The normality and linearity were tested before performing a parametric test (independent T-test). Descriptive analysis was performed for the handover characteristics, types of distractions, tools used and information included during handover. An independent T-test was performed to compare time spent and distraction numbers between nurse-to-nurse and doctor-to-doctor handovers. In addition, a T-test was performed to compare the time spent on handover and distribution numbers between the day shift (8.00 am to 4.00 pm) and evening shift (4.00–11.00 pm). A Pearson correlation was performed to identify any relationship between the time spent on handover and the number of distractions. The correlation also took into consideration differences between physicians’ and nurses’ handovers.

Results

Characteristics of the handover process

All handovers were face-to-face (100%). Of the observations, 84.4 and 15.6% were performed as patients were transferred out of and into ICU, respectively. It is common practice at the hospital for most of the handovers in ICU to be performed at patient bedside. The majority of the observations were taken during morning shifts (77.8%), with evening shifts accounting for 22.2%. Table 1 presents the characteristics of nurses and doctors observed during the handover process.

Types of distraction, documentation and tools, and information during the handover

There were 1.26 (±1.75) distractions per handover. In 45 (50%) handovers, no distraction occurred. There were several distractions, such as phone calls, people interrupting or portable ECG machines in the general wards during transfer, as well as others such as background noise. According to the results of the observations, people (46.7%) were the most common distracting factor during handovers, followed by phone calls (5.6%), but SMS and monitor alarms were not distracting at all during handovers (0%). Other factors, such as background noise, account for 12.2% of distractions. Figure 1 presents the types of distractions.

Documentation and tools used during handovers were checklists or handover sheets, reading back, patient records (paper or digital) and other tools such as verbal checking or using a blank piece of paper. Patients’ records were used the most during handover (68.9%), followed by checklists (52.2%). Reading back and other tools (6.7 and 14.4%, respectively) were used less frequently than patients’ records and checklists. Figure 2 presents the documentation and tools used during handover for MICU patients.

The information included most often during handover was background (96.7%), conditions (97.8%), what had been done (tasks 87.8%), abnormal findings (84.4%) and actions regarding the abnormal findings (87.8%). Information included least often during handover was do not resuscitate (DNR), which was specified in only 5.6% of handovers observed. Patients’ concerns (10%) were emphasized less often than family issues and information (41.1%). Figure 3 presents the types of information included during handover.

| Table 1 Characteristics of handover process (N=90 pairs) |
|---------------------------------|-----------|
| Participants                    | N pairs (%) |
| Nurse to nurse                  | 50 (55.6) |
| Doctor to doctor                | 40 (44.4) |
| Location of observations (N=90 pairs) |           |
| MICU                            | 58 (64.4) |
| General wards/units             | 32 (35.6) |
| Transfer types (N=90 pairs)     |           |
| Transferred in ICU              | 14 (15.6) |
| Transferred out of ICU          | 76 (84.4) |
| Handover time (N=90 pairs)      |           |
| Morning shift (0800–1600)       | 70 (77.8) |
| Evening shift (1600–2300)       | 20 (22.2) |
| Night shift (2300–0800)         | 0         |

Figure 1 Types of distractions (N= 90 pairs).
Time spent during handover and the number of distractions

Time spent during nurse-to-nurse handovers was significantly higher than that in doctor-to-doctor handovers ($P < 0.001$). Handover during the evening shift took significantly longer than that during the morning shift ($P = 0.045$). Nurses encountered significantly more distractions than doctors ($P < 0.001$), and the number of distractions during the evening shift was significantly higher than that during the morning shift ($P = 0.01$). There was a moderate positive significant relationship between time spent and the number of distractions ($P < 0.001$). If the number of distractions increased, the time taken for handover would also increase. Table 2 presents the relationship between time spent and the number of distractions during handovers.

Discussion

The study has identified the types of distractions, documentation, tools used and their relation to the factors involved in the handover of patient transfers in and out of the MICU. We found that distractions per handover were more common with longer handovers, with nurses and during the evening shifts. The most distracting factor was people (including staff, family members and patients). Increased distractions during the evening shifts may be related to fewer staff and overlap of visiting hours. A previous study [9] emphasized distractions and suggested active efforts to reduce them, but we did not find a study that quantified and measured the reasons for the distractions during handovers. Telephone calls and other factors (such as background noise) were also identified as distractions. Interestingly, in this era of universal availability of mobile phones, SMS was not identified as a distraction during handovers. This evidence is similar to the Halm et al. and Currie [7, 9] studies, which found that nurses, doctors, patients, their families and phone calls were distracting factors during

Figure 2 Documentation/tools used during handover ($N=90$ pairs).

Figure 3 Included information during handover ($N=90$ pairs).
handover. Critical care units are complex environments where healthcare providers usually work at a fast pace and everything needs to be prioritized. In ICU, it is possible that staff interrupts and disrupts each other during handover because something needs to be done urgently. Family members and patients are sometimes anxious to have information and may also interrupt during handovers. This distraction may lead to a failure of communication between healthcare providers [8], which in turn can jeopardize patient safety.

The OSSIE guide [8] recommends that distraction from people, phone calls and other distracting factors should be minimized during the handover process. In this study, the major distraction was people. The recommendation to limit the distractions from people is challenging since most handovers occur in a busy ward or ICU, where it is hard to avoid distractions from people. However, Pezzoles et al. [15] have pointed out that teamwork and situational awareness contribute to the quality of handovers. It says team members’ roles should be clearly identified and assigned. One team member could be assigned to take over the role of the nurse/doctor and take charge of the patient and family during handovers occurring. This might minimize the distractions from people during the handover.

According to the study tools used during handovers, most nurses and doctors used patient records and checklists (such as patient information and to-do lists) but rarely read back forms and other information (including their own notes or documents). Regarding patient records, our ICU uses fully computerized data [IntelliVue Clinical Information Portfolio (ICIP, Philips Healthcare)], and electronic health records (EHRs), including laboratory results, medication charts and radiological investigations are available for the whole hospital. While these are a mainstay for daily rounds, during handovers staff relied on memory, charts and paper records and used electronic data less frequently. Wong et al. [16] found that frequent use of electronic tools, such as handheld devices and EHRs, improved information transfer at handovers among nurses and medical staff. This finding is similar to a Gonzalo et al. [17] study, which found that using an electronic handoff tool called eSignout between unit transfers, with optional verbal communication, was perceived to be similarly safe and more efficient than verbal handovers. The use of technology during handovers might be an area that needs to be explored further.

Using checklists has helped in managing information without missing important patient data [18]. Several studies have found that using checklists improves the quality of the handover process and enhances quality of care and patient safety [2, 8, 16, 19]. Based on literature, using mnemonics and situation briefing techniques, such as SBAR (situation, background, assessment and recommendation), have been recommended as a standard communication framework for handover [2, 20]. SBAR is a structured method for communication that was designed to expedite cross-disciplinary communication by creating a common information structure [21]. Cornell et al. [21] found that using SBAR helped nurses to be more focused and spend less time during handovers. However, Hilligoss and Moffatt-Blake [22] argued that checklists and mnemonics might work against forgetting particular details or having a holistic understanding of patients. For example, patient and family concerns might be excluded. This limitation might need to be considered when developing checklists for handover. According to the results, 52.2% of doctors and nurses together used checklists during handovers. Therefore, educating and encouraging nurses and doctors to use the checklists during handovers might be one strategy for improving the handover process. The key elements of learning should include the importance and value of handovers and using checklists properly.

A reading back form for notes and other documents was rarely used in the study. Reading back has usually been used when receiving verbal orders from doctors, but not during the handover process. However, the World Health Organisation (WHO) and the Joint Commission International (JCI) have recommended that a reading back form should be used as a tool for communication during handovers [2, 4]. Zinn’s study [23] showed that 11% of preventable deaths in Australian hospitals are related to communication problems, whereas only 6% are due to the inadequate skill levels of practitioners. Further study is needed on sparse use of reading back forms by the healthcare providers during handovers.

Important information, such as patient background, condition and family, is usually included in the report during handover [9, 12]. Similarly, in this study, >80% of doctors and nurses included the patient’s background, condition, tasks or interventions that had already been done, abnormal findings and an action plan. Less than 50% of doctors and nurses included family information and collaboration with other disciplines. Interestingly, patients’ concerns and DNR status were the least emphasized during handovers for this study. Involving patients and families in the process of care is an important aspect of care delivery to ensure continuity of care [24]. Based on the results, patients’ concerns need to be addressed more often during handover for continuity of care. However, discussion about DNR status is a very sensitive topic, and whether or not to address this during the first encounter with the patient (although it may be necessary in ICU admissions) depends on cultural sensitivities and regulations in each country. Direct discussion of DNR status in non-Western cultures could be difficult and patients or relatives might view discussion of this topic as

<table>
<thead>
<tr>
<th>Time spent during handover (min)</th>
<th>N</th>
<th>Mean (SD)</th>
<th>Mean difference</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse–nurse</td>
<td>50</td>
<td>9.53 ± 3.58</td>
<td>6.72</td>
<td>(5.59, 7.86)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Doctor–doctor</td>
<td>40</td>
<td>2.81 ± 1.62</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning shift (8 am to 4 pm)</td>
<td>70</td>
<td>6.01 ± 4.18</td>
<td>2.25</td>
<td>(0.05, 4.44)</td>
<td>0.045</td>
</tr>
<tr>
<td>Evening shift (4 to 11 pm)</td>
<td>20</td>
<td>8.26 ± 4.95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distraction numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse–nurse</td>
<td>50</td>
<td>2.06 ± 1.96</td>
<td>1.76</td>
<td>(1.17, 2.35)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Doctor–doctor</td>
<td>40</td>
<td>0.3 ± 0.65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morning shift (8 am to 4 pm)</td>
<td>70</td>
<td>0.93 ± 1.46</td>
<td>1.47</td>
<td>(0.38, 2.56)</td>
<td>0.01</td>
</tr>
<tr>
<td>Evening shift (4 to 11 pm)</td>
<td>20</td>
<td>2.4 ± 2.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pearson correlation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Mean (SD) Mean difference 95% CI P-value

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Table 2 Relationship between time spent and number of distractions during handover
potentially de-escalating treatment or the patient’s wellbeing [25]. Therefore, including DNR status information during handover might be another area to explore [26] in future research.

Comparison between the time doctors and nurses spent during handover shows that nurses’ handovers were significantly longer than doctors’. However, it cannot be assumed that longer handovers are associated with better quality care. Longer handovers could also be related to the increased number of distractions (Table 2). This result is similar to the study by Currie [9], which found that additional distractions increase the time spent during handover, resulting in less attention being given to imparting information. In this study, nurses’ handovers had more handovers. This might suggest that handovers could be more efficient if nurses take less time by minimizing the distractions. Our data (Table 2) show that the number of distractions and time spent during the evening shift was significantly higher than the morning shift. Given that most distractions were from people, this was likely related to fewer staff being available and the overlap of visiting hours during the evening shift. However, only 20 pairs of handovers during the evening shift were observed.

Limitations and conclusions

The handover observations in this study were performed only when patients transferred in or out of the MICU, and we did not include handovers during shift changes. It is likely that the handover cultures are different between floors and critical care areas, and cultural issues like communication will also differ. Our study does not address these differences. The handover process may also differ with the experience and level of the doctors involved; these data were not included in the study. The study has addressed the types of distractions but did not observe how the doctors and nurses dealt with the distractions. Further investigation of this aspect might warrant future study. Finally, in our study, it was not possible to trace whether distractions and omissions led to subsequent medical errors.

Enhancing the quality of the handover process in the critical care setting is challenging. The types of distractions, tools used and information included in handovers have been identified in the study. Handovers between nurses were longer than those between doctors, and the time spent on the handover has a significant relationship to the number of distractions. The evening shift sees longer handover times and more distractions than the morning shift. An interesting result was that the nurses and doctors rarely address DNR status during handover of ICU patients, which is likely related to culture. However, cultural sensitivity was not addressed in the study. Therefore, the relationship between addressing DNR status and cultural sensitivity is highly recommended for future study.

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