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What is This?
Clinical shift handoffs in Singapore: A three-phase prospective

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A clinical shift handoff can be considered as a three-phase process, consisting of pre-handoff, handoff communication, and post-handoff. The majority of studies on clinical handoffs focused on the handoff communication. There is limited literature on how pre-handoff and post-handoff activities are conducted. This study aims to understand the handoff practice in a public hospital in Singapore from the three-phase process’ point of view, to identify potential problems that may occur in such a setting, and to discuss potential interventions to enhance clinical shift handoffs.

INTRODUCTION

A handoff is defined as “the transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis (Australian Medical Association, 2006). Its primary objective is to ensure accurate transfer of information about a patient’s state and plan of care (Patterson, Roth, Woods, Chow, & Gomes, 2004).

Existing Studies have shown that patient handoffs are high risk scenarios for patient safety. The Joint Commission (2002) reported that communication breakdown in multiple handoffs contributed to discontinuity of patient care across settings and shifts. Poor handoffs have been found to associate with delayed treatment, longer patient stays and more laboratory tests ordering, clinical errors and self-reported harm to patients (Horwitz, Moin, Krumholz, Wang, & Bradley, 2008; Kitch et al., 2008; Singh, Thomas, Petersen, & Studdert, 2007). Moreover, in some settings, handoffs are informal and unstructured with great variations (Bomba & Prakash, 2005; Lee, Levine, & Schultz, 1996; Volpp & Grande, 2003).

A handoff can be considered as a three-phase process, consisting of a pre-handoff phase, a handoff communication phase, and a post-handoff phase (Alvarado et al., 2006; Kerr, 2002; Raduma-Tomàs, Flin, Yule, & Close, 2010). The main objective of the pre-handoff phase is to ensure that the off-going party is ready to give a handoff to the on-coming party. It involves activities such as updating patient lists, collecting patient information, and preparing handoff sheets. In the handoff communication phase, the two parties communicate with each other in order to establish a common understanding of patients, through various kinds of communication media. In the post-handoff phase, the on-coming party prioritizes the handoff tasks, plans his/her duty and performs necessary actions.

Majority of research on clinical handoffs focused on the handoff communication phase, in particular, the information content being communicated. These studies explored the information coverage in handoffs and offered important design guidelines on handoff content standardization. However, there is limited literature on how the pre-handoff and post-handoff activities are conducted. This study therefore aims to understand the current handoff practice from the perspective of the three-phase process, to identify potential problems that may occur, and to discuss potential interventions to enhance patient handoffs.

BACKGROUND

A large body of research on clinical handoffs has focused on the handoff communication phase. Arora, Johnson, Lovinger, Humphrey and Meltzer (2005) conducted an critical incident analysis of patient handoffs in an internal medicine department. They found two major categories of failed communication: omitted content and failure-prone communication processes.

Ye, McD Taylor, Knott, Dent and MacBean (2007) analyzed the handoffs of 914 patients during a 3-month period. They found that in 109 (15.4%) handoffs information was perceived as lacking, especially details of management (35.5%), investigations (33.5%) and disposition (33.5%). There was a significant difference in the perceived quality of handoffs when all required information was handed off and when it was not. As a result of perceived inadequate handoffs, the doctor/ED and patient were affected adversely in 62 (8.8%) and 33 (4.7%) cases, respectively.

Borowitz, Waggoner-Fountain, Bass, and Sledd (2008) studied the residents’ sign-out at two general pediatric wards over 98 days. After each night of duty, the participants were asked to complete a post-call survey, focusing on the...
sign-out information they received previously. In 49/158 (31%) surveys, residents indicated something happened while they were on-call for which they were not well prepared. In 40 of the 49 cases, they indicated that the transferred information was inadequate, and the missing information would have been useful.

Flanagan, Patterson, Frankel, & Doebebling (2009) evaluated a physician informatics tool at Indianapolis VA medical center. They coded the patient information into 22 categories and found that 90% of the forms generated by the patient handoff tool included the following information: patient identifiers, patient demographics, ward location, current medication list, problem list, and short-term concerns. However, less than half of the forms included patient race, allergies, code status, IV access, laboratory test results, long-term plan, and psychosocial concerns.

These studies were concerned with the handoff communication phase and the results provided great insights on how we can structure and standardize the communication. However, there are few studies addressing the pre-handoff and post-handoff phases. One exception is the study of Kerr (2002). He observed 20 patient handoffs in a large pediatric hospital and found that in the pre-handoff phase, there was no standard on how it should be conducted. In one ward, a majority of nurses were involved in other activities and the rest few were responsible for the pre-handoff activities. They collected information from team colleagues, official documents and their personal notes. In another ward, however, more off-going nurses were involved in pre-handoff activities. A handoff document was passed around the off-going nurses until a full report was recorded.

In the post-handoff communication phase, the on-coming nurses engaged in activities including information-gathering from parents and documents, and walking around the ward to meet the patients and parents.

METHODS

The National Healthcare Group (NHG) Domain-Specific Review Boards (DSRBs) approved this study and all participants gave informed consent.

Setting

The study was conducted in the general medical ward of a Joint Commission International (JCI) accredited university hospital in Singapore. Currently, the general medical service has 943 beds and comprises 22 house officers (HO - equivalent to intern), 53 medical officers (MO - equivalent resident), 30 registrars, and 85 consultants. When a patient is hospitalized, he/she is assigned to a primary care team comprising of 1 HO, 1 MO, 1 registrar and 1 consultant. The HO and the MO serve as primary care providers. The registrar and the consultant function as supervisors.

The general medical ward runs a shift system, with three handoffs occurring daily: night-day handoff (0800), day-evening handoff (1730) and evening-night handoff (2030 /2230). Most of the time, handoffs occur between two MOs and occasionally between one registrar and one MO. Primary team physicians finish their work at 530pm and hand off admitted inpatients to one physician, who is referred to as ‘evening on-call’ physician. Evening on-call physician finishes their shift at 1030pm and hand off to two ‘night on-call’ physicians, who hand off to the primary team at 0800 the next day. Currently, there is no well-established structure for handoff in the general ward. Physicians can choose their own method to handoff patient information. A common method adopted by the physicians is handoff over the phone. While off-going physician(s) make phone calls to on-call physician(s), on-call physician(s) write down critical information on a blank piece of paper.

The department has identified that handoffs between primary team physicians and evening on-call physicians were most problematic in the cycle because of the high sender/receiver ratio. Therefore, this study focused on the handoffs between them.

Participants

Twenty four physicians comprising 14 female and 10 male participated in the study. All the participants were MOs undergoing training within a certain specialty, with lengths of experience ranging from 6 months to 4 years (Mean = 2.8 years, SD = 1.2 years). Their ages ranged from 24 to 33 (Mean = 27.2 years, SD = 2 years). A majority of them graduated from Singapore or from the UK.

Data collection

Data was collected through semi-structured interviews. The semi-structured nature afforded two-way communication and allowed interviewers to probe follow up questions. First, the participants were presented with a list of patient information categories and asked to identify essential information categories that should be handed over and essential categories that are poorly handed over in their current practices (see Table 1). Second, participants were asked to describe their current practices of handoffs, followed by opinions and suggestions to improve the current practices (see Table 2).

Data Analysis

All interview recordings were transcribed using Transcriber®, and reviewed by Subject Matter Experts (SMEs) to detect misinterpreted terms. To study the general perceptions of handoffs, we conducted qualitative analysis of the interview data, following standard procedure for inductive analysis (Johnson & Christensen, 2004). Two human factors researchers reviewed the data independently and coded for themes. Differences were discussed and negotiated until a consensus was reached.
### Table 1 Information Categories

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Patient name</th>
<th>Patient sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient age</td>
<td>Ward/Bed</td>
<td>Social background</td>
</tr>
<tr>
<td>Current diagnosis</td>
<td>Examination findings</td>
<td>Presenting complaint</td>
</tr>
<tr>
<td>Investigation ordered</td>
<td>Investigation results</td>
<td>Consultant in charge</td>
</tr>
<tr>
<td>Follow up actions</td>
<td>Active medications</td>
<td></td>
</tr>
<tr>
<td>Important past medical history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication made with patient families</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2 Interview Questions

When you are about to finish your shift as a primary team physician,
- Please describe your normal practice of handing off patients to the evening on-call physician.
- How do you decide who to hand off?
- How do you collect all the relevant information?
- How do you make sure the requested task has been completed?

When you are evening on-call physician,
- How do you remember the information handed off to you?
- If you are based on written notes, how do you structure your information?
- How do you prioritize the importance of patients?
- Please describe the type of tasks you are requested to perform during your duty as the evening on-call physician.

Opinions and suggestions
- Can you identify weaknesses/strength in your handoff practices?
- Do you believe the current handoff practices could be improved? If yes, how?

### RESULTS

Six categories were identified by more than half of the participants as essential information during handoffs: ward/bed (100%), current diagnosis (100%), follow up actions (90.5%), important past medical history (90.5%), patient ID (66.7%), and investigation ordered (57.1%). Four categories were identified as information categories poorly handed off in the current practice, including patient ID (33.3%), communication made with patient families (28.6%), patient name (14.3%) and follow up actions (14.3%).

Participants reported that the number of patients that primary team physicians responsible for ranged from 5 to 20, depending on the subspecialty from where the physicians came. Normally, one primary team physician would hand over less than three patients.

The patients they handed over included sick patients, patients with important pending diagnostic test results, patients with pending referrals from other subspecialties, patients with special code statuses, patients with demanding families, and patients with behavioral or mental problems. They also commented that the handoff decisions were team based decisions, which were made together with the consultants and the registrars during the exit rounds.

Several information sources were referred to in order to collect handoff information, including the computerized medical system, patient case notes, patient lists and personal notes. However, the majority of the participants stated that they usually did not collect patients’ information from different information sources. Instead, they retrieved patients’ relevant information from memory directly. It can be illustrated by one participant’s comments on how she collected patient information: “Generally, because I know the patient very well, I just think about it for a few seconds, and try and make some coherence before I tell MO3 (the evening on-call physician). Sometimes I write it down, but usually I just think about it.”

The participants reported that as primary team physicians, they checked the computerized medical system and the patient case notes the next day to ensure that the requested tasks were completed.

All the participants stated that when working as on-call physicians, they took notes during handoffs. A majority of them (18/21) organized their notes according to chronicle sequence of handoff calls, while a small number organized according to task types (1/21) and patient locations (2/21). Most of the time, the primary team physicians did not indicate the severity of patients during handoffs and it was based on the on-call physicians’ clinical judgment to decide and prioritize the importance of patients.

Four major types of ‘to do’ tasks were mentioned: reviewing sick patients, tracing diagnostic test results and act upon it, tracing referral reply and act upon it, and attending to emergencies. All participants stated that they gave priorities to reviewing sick patients and attending to emergencies than tracing diagnostic test results and tracing referral reply.

Eight participants shared their view on the strengths of the current handoff practice, including symmetric communication (1/8), convenience of communication obtained by the mobility of phone calls (5/8), and affordance of clarification obtained by verbal communication (3/8).

Seventeen participants identified three main areas of weaknesses for the current practice. The first area was concerned with communication content: omission of important information including double identifier (5/17), specific to do task (6/17), resuscitation status (1/17), and baseline information (1/17), disorganization of handoff information (3/17) and information overload (2/17). Specifically, the participants stated that patients’ location used in the current practice was not a good identifier since patients could be moved to different locations at night due to some medical reasons. Moreover, participants mentioned that the primary team knew their patients better and hence they should identify potential abnormality and give solutions or guidance, especially for complicated cases. The second area focused on handoff media: difficulty to convey information over the phone (3/17) and lack of official written documents (4/17). The difficulty to convey information can be illustrated by one participant’s response - “There may be miscommunication
over the phone, but I try to eliminate that by getting the person to repeat, or if I answer the phone call, I repeat to the person what exactly I am supposed to do. There is no proper documentation of the handover per se.” The third area targeted the organizational factors: high workload (2/17) and no protected time for handoff calls (1/17).

The participants identified several possibilities for improving the current handoff practice, including enforcement on mandatory information categories such as double identifier, ‘to do’ tasks and contingency plans, and providing written document besides verbal communication.

**DISCUSSION**

Based on the three-phase process, we identified several points of vulnerability in the current handoff practice. In the pre-handoff phase, the physicians’ inclination towards memory retrieval rather than referring to written documentation indicates that patient safety largely depends on the primary team physicians’ ability of retrieving patients’ information accurately. However, Knowing information is stored in long-term memory does not guarantee that it will be retrieved successfully when needed (Wickens & Hollands, 1999). Moreover, a considerable amount of studies have shown that in general people are overconfident in eyewitness memory and general knowledge (Bornstein, 1999). Failure to retrieval or inaccurate retrieval of any critical patient information may lead to suboptimal information exchange, resulting in near misses or adverse events.

In the handoff communication phase, weaknesses related to communication content, media and organizational factors were identified. Omission of patient information was often reported by the participants. In particular, omission of double identifier and information on specific ‘to do’ tasks were the most problematic in the current practice. According to the SMEs, it is important to use at least 2 non-modifiable identifiers to recognize patients before the conduct of any important procedures like administering medications/blood products. Common identifiers include patient name, patient ID number, social security number, and so on. Meanwhile, specific ‘to do’ tasks and contingency plans are considered as the most important information to guide the on-call physicians through their duty. Handoff of both information categories were not well supported in the current practice.

The difficulty to communicate over the phone could be due to the handoff environment. It was observed that there were two locations where the on-call physicians received handoff calls: the residents’ room and the nurses’ station. In addition, the participants sometimes received handoff calls in transit. The nurses’ station was the administrative center for nursing care. It was usually occupied by nurses and physicians and thus subject to frequent interruptions and environmental noise. The residents’ room was relatively quiet compared to the nurse station. However it was shared among all the physicians. The interruptions and environmental noise made it difficult for the on-call physicians to hear clearly the handed off information.

Moreover, synchronous verbal communication without the aid of written documents may impose high workload on the on-call physicians. As summarized in ‘human factors of transition of care’, the on-call physicians are experiencing high mental workload during handoff communication (Harvey, Schuster, Durso, Matthews, & Surabattula, 2006). Their activities include perceiving and understanding the transferred information, probing for more details when necessary, and synthesizing all the information to create an accurate mental model of the patient. Under such high mental workloads, it is difficult for the on-call physicians to write down manually every piece of information they receive. Omission or incompletion of some critical patient information becomes possible.

In the post-handoff phase, the handwritten notes were the main memory aids that the on-call physicians counted on in order to complete all the ‘to do’ tasks. Adopting from the framework of prospective memory (McDaniel, 2007), the handwritten notes offered no structuring, prioritizing, and reminding functions. The on-call physicians may miss the perfect window for the ‘to do’ tasks, leading to compromised patient safety.

**LIMITATION**

The study took place in one department in one institution, so there are limitations in how far the findings can be generalized to other clinical specialties or institutions. However, most participants in this study were under a nationwide residency program which allowed them to move from one institution to another in a 6-month rotation. According to their feedback, the handoff protocols in the medical departments of other institutions are similar.

**FUTURE STUDY**

Further experimental based studies on the identified vulnerabilities may be valuable. A focus could be to address why physicians are inclined to retrieve patient information from their memory. Another focus could target how on-call physicians prioritize the importance of patients and act upon the ‘to do’ tasks.

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REFERENCE


