Journal of Critical Care 29 (2014) 311.e1–311.e7

Contents lists available at ScienceDirect

Journal of Critical Care

journal homepage: www.jccjournal.org

Electronic Articles

Comparative evaluation of the content and structure of communication using two handoff tools: Implications for patient safety☆,☆☆,★,★★

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ARTICLE INFO

Keywords:
Handovers
Care continuity
Information transfer
Critical care

ABSTRACT

Purpose: Handoffs vary in their structure and content, raising concerns regarding standardization. We conducted a comparative evaluation of the nature and patterns of communication on 2 functionally similar but conceptually different handoff tools: Subjective, Objective, Assessment and Plan, based on a patient problem-based format, and Handoff Intervention Tool (HAND-IT), based on a body system-based format.
Method: A nonrandomized pre-post prospective intervention study supported by audio recordings and observations of 82 resident handoffs was conducted in a medical intensive care unit. Qualitative analysis was complemented with exploratory sequential pattern analysis techniques to capture the characteristics and types of communication events (CEs) and breakdowns.
Results: Use of HAND-IT led to fewer communication breakdowns ($F_{1,80} = 45.66$: $P < .0001$), greater number of CEs ($t_{40} = 4.56$; $P < .001$), with more ideal CEs than Subjective, Objective, Assessment and Plan ($t_{40} = 9.27$; $P < .001$). In addition, the use of HAND-IT was characterized by more request-response CE transitions.
Conclusion: The HAND-IT's body system-based structure afforded physicians the ability to better organize and comprehend patient information and led to an interactive and streamlined communication, with limited external input. Our results also emphasize the importance of information organization using a medical knowledge hierarchical format for fostering effective communication.

1. Background and significance

Patient handoffs refer to the transfer of care services between providers during care transitions [1-3]. Although handoffs are key to maintaining continuity of care [4], they are considered a threat to patient safety due to the inherent breakdowns and errors in their execution. Earlier reports have suggested that handoff breakdowns contribute to nearly 35% of medical errors and adverse events [5]. These errors arise as a result of a variety of communication challenges caused by differences in hierarchy, language, and general communication skills and expectations between oncoming and outgoing clinicians [6-12].

Recent research has suggested the key role of handoff content frameworks in standardizing the structure of communication [4]. Although clinician conformance to these content frameworks has been questioned [13], these frameworks impose an information organizational format with a list of items that have to be communicated during handoffs (such as patient identifiers, illnesses, laboratories, and management plans). The problem-based and the body system-based models are 2 commonly used content frameworks. The problem-based model [14-18] supports the structuring of information around the key patient problems, whereas the body system-based model [19] allows the organization of information by body/organ systems (eg, cardiovascular, pulmonary, and neurology).

Informed by these frameworks, several handoff tools have been developed to support communication between clinicians during transitions. These tools manifest in the form of checklists [20,21], templates [22-25], and electronic health record-integrated systems

☆ This research was conducted at the University of Texas Health Science Center, Houston, TX.
☆☆ Contribution: JA conceived the study and collected the data. JA coded all transcripts, whereas TK coded 25% of the transcripts for reliability analysis. JA and TK performed all qualitative and quantitative analysis. All authors participated in the interpretation of data, helped to draft the article or revise it critically for important intellectual content, and gave final approval of the version to be published.
★ The authors were supported by a grant from the James S. McDonnell Foundation on Cognitive Complexity and Error in Critical Care (grant 220020152 to Vimla L. Patel).
★★ Competing interests: All authors have completed the Unified Competing Interest form at http://www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare: all authors were supported by a funding from the James S. McDonnell Foundation; no financial relationships with any other organizations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.

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http://dx.doi.org/10.1016/j.jcrc.2013.11.014

[26-30]. Although most handoff tools use the problem-based model as a mechanism for structuring communication [24,31], the system-based tools have been used sparingly for supporting handoffs [32]. Despite such efforts, several researchers have highlighted shortcomings in the development and evaluation of handoff tools based on these frameworks [33-36]. For example, problem-based tools have been criticized for their open-ended yet limiting structure of content organization, which increases the potential risk for information loss and inconsistencies in communication.

Although there are several research studies that report on the various types of handoff tools, there is limited research on (*a*) the differences in the patterns of communication fostered by different handoff tools and (*b*) the impact of these differences on handoff communication breakdowns. Our research objective is to compare the effectiveness of the nature and patterns of communication using 2 functionally similar but conceptually different handoff communication structures: a patient problem-based model and a body system-based model. To compare the effectiveness of communication afforded by 2 content models, we evaluated a problem-based, Subjective, Objective, Assessment and Plan (SOAP) and an indigenously developed, system-based HANDoff Intervention Tool (HAND-IT) [37]. Our methodological approach contrasts with prior evaluation studies on handoff tools that have primarily used survey-based and self-reported measures [17,23,32,38,39]. We focus on the analysis of the content of communication and the inherent communication breakdowns during these interactions. Communication breakdowns represent the gaps in available information and provide a systematic basis for evaluating the impact of the tool structure on communication effectiveness.

2. Method

This study was part of a larger study involving the evaluation of handoffs in critical care settings. This article focuses on the comparative evaluation of 2 handoff tools: SOAP and HAND-IT.

2.1. Study setting

The study was conducted in a 16-bed, closed medical intensive care unit (MICU) of an urban academic hospital in Texas with approximately 55 000 emergency department visits per year. Patients in this unit stayed for an average of 4 days and required multiple handoffs (additional details in Section 3 of Appendix A).

2.2. Handoff tools used for evaluation

The SOAP uses the problem-based information organizational format that includes subjective information (eg, patient history), objective information (eg, vital signs), assessment information (eg, differential diagnosis), and plan-related information (eg, new procedures, orders). A detailed description can be found in the Appendix A (see Section 2).

The HAND-IT was designed and developed at this research site as part of a multiyear longitudinal study that evaluated the overall handoff process [40,41]. The tool content was structured based on the body system model that mirrors the medical school training curriculum [42] in supporting standardization of content [43]. The order of the body system information is based on importance and relevance to critical care workflow: pulmonary, cardiovascular, infectious disease, renal/genitourinary, gastrointestinal/liver/nutrition, neurology, endocrinology, and hematology. The fundamental content categories are organized in a checklist format that includes physical examination/laboratories, medications, problem list, assessment, and plan and system diagnosis for each body system. Furthermore, we included categories such as patient admission, pending tasks, and important management events during the past shift and contingency plan to support summarization through patient case narratives. A detailed description can be found in the Appendix A (see Section 2).

2.3. Physician handoffs in MICU

As there was no formal resident "sign-out" procedure at the study site, morning rounds were used for handoffs between resident teams. During these group handoffs, an outgoing team (resident and/or intern) presented patient care-related information by verbalizing the written content on a handoff tool to an oncoming team (attending, fellow, resident, and intern). Patient nurses, pharmacists, and respiratory therapists also attended these sessions. The attending physician moderated the discussion, which often involved follow-up questions on the information presented. The rest of the oncoming team played a "passive" role, by interjecting into the discussion when necessary to provide supporting information or clarification [40] (see Section 1 in Appendix A).

2.4. Participants

There were 10 participants over the study period of 2 months: 2 attending physicians, 4 interns, and 4 residents. The participants were divided into 2 teams: each team was in the MICU for a period of 1 month and consisted of 5 core participants who participated in the rounds for that entire month (1 attending, 2 residents [PGY 2/3], and 2 interns [PGY 1]). In addition to this, there were 2 fellows, 12 nurses, 2 registered respiratory therapists, and 6 medical students who participated in the rounds. Each intern/resident was responsible for up to 8 patients at a time.[1] A total of 82 individual handoffs were conducted across both tools (41 for each handoff tool). The institutional review board of the hospital and university approved the study, and written consents were obtained from all participants.

2.5. Study design

We used a nonrandomized pre-post prospective intervention study to compare the effectiveness of communication between 2 handoff tools. In the first month, team 1 (5 participants: 1 attending, 2 residents, and 2 interns) used SOAP for 4 days as part of their training, followed by 2 days of testing. Immediately after this, team 1 used HAND-IT for 4 days as part of their training, followed by 2 days of testing. In the second month, the tools were presented to team 2 (a new set of 5 participants: 1 attending, 2 residents, and 2 interns) in the reverse order for counterbalancing the effects of tool use. The training period helped the participants become introduced to and familiarized with the information content and structure of the tool. This also helped them understand the information categories that were required from various information sources and the information expectations of the oncoming team. Data for analysis were collected only during the testing days (additional details can be found in Section 3 in Appendix A).

2.6. Data collection

Data collection involved audio recording of interactions during handoffs. The first author took copious field notes on the contextual features underlying these communication exchanges. A total of 96 hours of data were collected. Handoffs during morning rounds commenced around 8 AM and lasted approximately 4 to 5 hours. The MICU team moved around the unit as they progressed through the list

[1] Although residents were primarily in charge of all the patients in the unit, interns were allocated half of the MICU patients to their care. This allocation was based on a number of factors including patient criticality and intern expertise.