Communication failures in patient sign-out and suggestions for improvement: a critical incident analysis

V Arora, J Johnson, D Lovinger, H J Humphrey, D O Meltzer

Background: The transfer of care for hospitalized patients between inpatient physicians is routinely mediated through written and verbal communication or “sign-out”. This study aims to describe how communication failures during this process can lead to patient harm.

Methods: In interviews employing critical incident technique, first year resident physicians (interns) described (1) any adverse events or near misses due to suboptimal preceding patient sign-out; (2) the worst event due to suboptimal sign-out in which they were involved; and (3) suggestions to improve sign-out. All data were analyzed and categorized using the constant comparative method with independent review by three researchers.

Results: Twenty-six interns caring for 82 patients were interviewed after receiving sign-out from another intern. Twenty-five discrete incidents, all the result of communication failures during the preceding patient sign-out, and 21 worst events were described. Inter-rater agreement for categorization was high (κ = 0.78–1.00). Omitted content (such as medications, active problems, pending tests) or failure-prone communication processes (such as lack of face-to-face discussion) emerged as major categories of failed communication. In nearly all cases these failures led to uncertainty during decisions on patient care. Uncertainty may result in inefficient or suboptimal care such as repeat or unnecessary tests. Interns desired thorough but relevant face-to-face verbal sign-outs that reviewed anticipated issues. They preferred legible, accurate, updated, written sign-out sheets that included standard patient content such as code status or active and anticipated medical problems.

Conclusion: Communication failures during sign-out often lead to uncertainty in decisions on patient care. These may result in inefficient or suboptimal care leading to patient harm.

F ailures in communication between healthcare personnel have been implicated as threats to patient safety in several studies. These failures also account for over 60% of root causes of sentinel events reported to the Joint Commission on Accreditation of Healthcare Organizations. Communication is particularly important but vulnerable to error during times of transition or a “hand-off” from one healthcare professional to another. Previous studies have aimed to define the characteristics of a “hand-off” in a variety of settings and contexts such as nursing shift report, ambulance to hospital transfer, and emergency medicine shift changes. Another time of transition that requires effective communication is the transfer of care for hospitalized patients from one physician to another during shift changes. This transfer or “sign-out” can refer to either the verbal or written communication of patient information which is designed to familiarize oncoming or covering physicians with patients for whom they will be responsible.

The unpredictable course of acute illness during a patient’s hospital stay requires varying levels of care by oncoming or covering physicians. The lack of familiarity of covering physicians with the details of the patient’s illness and hospital stay can make these transition periods especially vulnerable to errors, jeopardizing patient safety. This is especially true in academic hospitals which are generally staffed by physicians-in-training who may lack experience and knowledge with which to make informed decisions on patient care during these times of discontinuity. The quality and safety of the sign-out or “hand-off” process in academic hospitals has also come under increasing scrutiny in many nations because of the efforts to reduce duty hours for medical trainees. The few studies to date which have examined the hand-off process confirm that it is variable, unstructured, and prone to error. To improve the integrity and quality of this process, the nature and effects of communication failures that may lead to patient harm need to be understood. This study focuses on those communication failures that result in adverse events or near misses, defined here as “critical incidents”. Using these critical incidents, this study characterizes the failures in communication that occur during the in-hospital sign-out of patient care between physicians-in-training and suggests areas for improvement.

METHODS

Transfer (“sign-out”) of inpatient care at the University of Chicago

To transfer care of their patients, internal medicine first year resident physicians (interns) at the University of Chicago Hospitals prepare and print a Microsoft Word document with pertinent patient information. These documents are then verbally summarized by departing (primary) interns to covering interns who remain on duty overnight (“on-call”) to provide night coverage for their own patients as well as the hospitalized patients of other interns (“cross-coverage”). Covering interns may refer to and modify these documents with handwritten notes in the margins when patient care issues arise on one of the patients that they are covering during their on-call period. When the primary interns return the next morning, they contact their respective covering intern who is now “post-call” to receive an update of events that occurred overnight and to retrieve the written sign-out document with the updated notes from covering physicians (Appendix 1).
covering interns (fig 1). Starting at noon on the day of receiving the sign-out from their post-call day and primary interns were interviewed to improve. Covering interns were interviewed at 7 am on peers' written and verbal sign-out and suggest areas of preceding shift (box 1). They were also asked to describe the led to patient harm, interns were asked to identify and incident reports were compared using a stepwise approach. To this inductive approach with no a priori assumptions, open coding process. Secondly, incidents were compared of an individual's observation of their own behavior or of others. To identify communication failures that possibly led to patient harm, interns were asked to identify and describe near misses or adverse events that took place either as a result of a poor written or verbal sign-out from the preceding shift (box 1). They were also asked to describe the most severe adverse event they could recall in the past year due to a suboptimal sign-out and, lastly, to evaluate their peers' written and verbal sign-out and suggest areas of improvement. Covering interns were interviewed at 7 am on their post-call day and primary interns were interviewed starting at noon on the day of receiving the sign-out from covering interns (fig 1).

To ensure all interns were experienced with cross-coverage at the time of the interviews, interviews were conducted in the last quarter of the academic year. To minimize the effect on future behavior, interviews were only performed on the last weekday of the month-long inpatient general medicine rotation. Because interns rotate on the inpatient general medicine service more than once, the last weekday of the months of March and June were chosen to provide an adequate sample of representative interns while attempting to reduce the number of interns who would be interviewed more than once.

### Data analysis
All interview data were stripped of identifying information and replaced with labels to reflect intern's call status (covering or primary) and unique voice (1, 2, 3, etc). These data were then reviewed by three investigators (VA, JJK, DL) and analyzed by the constant comparative method. Using this inductive approach with no a priori assumptions, incident reports were compared using a stepwise approach. Firstly, data from each incident were categorized during an open coding process. Secondly, incidents were compared across interviews to yield integration or refinement of categories, including grouping related categories or creation of sub-categories. By using the core or main categories that emerged, this categorical scheme was then selectively applied to all the data. Kappa statistics were used to determine inter-rater agreement for the categorization of critical incidents by the three independent reviewers. Reconciliation of all discrepancies was achieved by consensus.

The Institutional Review Board of the Biological Sciences Division of the University of Chicago approved this study.

### RESULTS
All 30 interns who rotated on the inpatient general medicine service in March and June 2004 were eligible for participation in the study. Of these, 26 interns collectively caring for 82 patients were interviewed after two different call nights. Twenty-five distinct incidents were reported, all of which were the result of a communication failure in the written or verbal sign-out from the preceding shifts. Interns also reported 21 worst events due to deficient sign-out that occurred in the preceding year. Inter-coding agreement for categorization of incidents was high with kappa statistics ranging from 0.78 to 1.0 per category.

The eight covering interns (four from each call night) cited failures of communication at sign-out from the prior evening, while remaining primary interns described failures at retrieval of sign-out that morning. In several instances, communication failures described at both times involved the same patient. For example, a covering intern (C1) reported: "I get over six calls yesterday for a patient who had hypertension whose blood pressure is frequently over 200. We never discussed this and when I went to the chart, I realized that this has been a problem for the last 2 days … The patient was requiring a lot of IV medication to control his blood pressure…"

Later that day the primary intern (P1), after communicating with this covering intern, reported: "I wasn’t told by the covering intern that there was a patient who had high blood pressure and that they needed to give IV hydralazine.”

Two major categories referred to the contributing factor in the communication failure. One was referred to in the analysis as “content omissions” in which critical information needed to care for a patient was not communicated, either verbally or in writing, during the hand-off process. Incidents in this category could be further classified as: (1) failure to report an active medical problem; (2) failure to report a medication or other treatment; (3) failure to report pending or ordered diagnostic tests or consults (table 1). Of these, the most common was a failure to report an active medical problem. In several cases this active medical problem had already been worked up but covering interns felt that they were “starting from scratch”.

The other major contributor to communication failures referred to failure-prone communication processes. This was further divided into three sub-categories (table 1). In at least two events, interns cited lack of face-to-face communication as a factor in a critical incident. In two other events, primary interns reported that handwritten notes on the written sign-out from covering interns were unclear or illegible, leading to confusion regarding a patient care issue. Lastly, in three events interns described a failure in communication resulting from the use of a second covering resident physician referred to by the intern as “night float”. The night float physician, who may care for patients between midnight and 7 am, results in an additional hand-off for each patient in a 24 hour period as follows: (1) primary intern to covering intern; (2) covering intern to night float; (3) night float to primary intern. In all of these events an initial covering intern had recorded illegible comments or made unclear verbal
Communication failures in patient sign-out

comments to a night float physician. The following morning the primary intern received no verbal communication from the night float physician regarding these events, resulting in the primary intern having actively to seek out the initial covering intern.

Regardless of what contributed to the communication failure, in nearly all cases (21/25) these failures led to uncertainty by the intern during patient care decisions. The frequent use of phrases such as “I did not know,” “I was not aware”, or “I was unsure” by interns reflects this uncertainty. In nearly half the incidents reported from the preceding shift, interns attempted to resolve this uncertainty (table 2). In most cases they did this by actively soliciting information from other sources, such as interviewing the patient, looking in the chart, or seeking out the covering intern or another resident. In a few cases they had to engage in unnecessary or repeat work such as reordering tests or procedures. In some cases, despite these efforts, interns remained uncertain. One intern (C5) stated: “I had no idea what I should do. I went to see the patient and interviewed her and still could not figure out what I was supposed to do.”

In examining the reports of worst events caused by poor sign-out, omitted content remained the dominant category (table 3). In the 21 worst events described by these interns, seven were the result of failures to communicate an active or ongoing medical problem. Specifically, omission of a patient’s code status, either written or verbally, was a major sub-category. In all five of these events a patient with a “Do Not Resuscitate” order was actively resuscitated because the written sign-out did not contain the code status for the patient. Another type of omission referred to events in which the rationale of a decision of the primary team was not communicated, such as why antibiotics were not started. This category was reserved for those failures that were not the

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**Table 1 Categories of communication failure in sign-out from preceding shift**

<table>
<thead>
<tr>
<th>Category (n)</th>
<th>Sub-category (n)</th>
<th>Representative incident (n = 25)</th>
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<tr>
<td>Content omissions (22)</td>
<td>Active medical problems (9)</td>
<td>“There was a patient that had hematuria and it was not indicated on the sign-out. They had ordered CBI [continuous bladder irrigation] and I had no idea.” (C3)</td>
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<td>Medications or treatments (11)</td>
<td>“There was a patient who had their heparin drip turned off and it was not mentioned to me that it was turned off.” (P2)</td>
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<td>Tests or consults (10)</td>
<td>“There was a consult that was pending that was not listed and then ID [Infectious disease] and pulmonary called with recommendations and there was no note that these recommendations were coming or what I should do with them.” (C2)</td>
</tr>
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<td>Failure-prone communication processes (8)</td>
<td>Double sign-out (“night float”) (3)</td>
<td>“One of my patients – it just said ‘will need ic’– I did not know where, who recommended it or unclear if it was to schedule this or if it had already been scheduled. Obviously I needed to know what happened before I went to see my patient so I called the primary intern who was cross covering before the float came on.” (P4)</td>
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<td>No face-to-face communication (4)</td>
<td>“He called me while he was in clinic so it was brief and over the phone and I would have preferred that our sign-out was face to face so I had a chance to ask questions. He had to go to clinic so he just put the sign-out on the wall and then called from there.” (C4)</td>
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<td>Illegible or unclear notes (2)</td>
<td>“The writing from the prior intern was illegible. Later on, I found them and figured out what it meant.” (P3)</td>
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*More than one category and sub-category mapped to these 25 distinct critical incidents.*
dose received, but the reason for the medication was unclear. The attending physician ordered the medication but did not communicate the rationale to the covering intern.

In suggesting areas of improvement for verbal sign-out, interns also highlighted overall features of desirable sign-out sheets. Several interns commented on the need to keep content on the written sign-outs updated to reflect most recent changes in medications, medical problems, or pending tests. Two interns specifically noted that there might be irrelevancy on the written sign-out. One of these interns (P8) offered an explanation by stating:

“The written sign-out has a different role than just a capture of a patient. We use it to keep track of everything but sometimes that makes it difficult to know what is going on right now since there is so much extra information on it.”

Interns often use their written sign-outs as “to do” lists to remind them of their work in progress, or what psychologists refer to as a “cognitive artifact” or a tool to aid in the recollection of various tasks related to the workflow of an intern.” However, this use may interfere with the primary function of written sign-outs, to provide information and guidance to covering physicians during care for patients.

**DISCUSSION**

This study of critical incidents describes a categorical scheme with which to classify communication failures during sign-out of patient care between physicians-in-training and makes suggestions for improvement. This taxonomy of communication failures and potential improvements may be informative in designing educational and system-based interventions to improve the quality of sign-out (table 6).

However, before such improvements can be undertaken, it is important to consider why such failures occur. One probable reason is that the inevitable daily changes in the course of a patient’s hospitalization makes the task of keeping information up to date increasingly difficult, potentially resulting in omissions or out of date information. Secondly, few medical trainees receive formal instruction, supervision, or receive feedback in the “handoff” process.

Table 2: Response to communication failure during sign-out

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<tr>
<th>Category (n)</th>
<th>Sub-category (n)</th>
<th>Representative incident</th>
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<tbody>
<tr>
<td>Attempt to resolve uncertainty (9)</td>
<td>Unnecessary or repeat work (2)</td>
<td>“A patient who had a tracheostomy had disconnected an extubation tube. I was not even sure why this patient had a tracheostomy. We had not discussed it and it was not written down. We 4 called anesthesia because the tracheostomy was pulled out but later I found out that the tracheostomy was just for supplemental oxygen and not necessary.” (C6)</td>
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<td>Solicit information from others (8)</td>
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<td>“There was a patient who was having pain… and the cross-cover ordered pain medication and it was written on the sign-out but not discussed. I did not know why it was ordered and then I asked the patient but I felt like I should know that the patient was having back pain.” (P13)</td>
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Table 3: Categories of failed communication in worst events due to poor sign-out

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<thead>
<tr>
<th>Category (n)</th>
<th>Sub-category (n)</th>
<th>Representative description of worst event (n = 21)*</th>
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<tr>
<td>Content omissions (17)</td>
<td>Active medical problem (7)</td>
<td>“I spent a lot of hours with a bowel ischemia patient who was having pain and bright red blood per rectum. He had a history of clots and I had called surgery, done serial exams, ordered a lactate. Later, the next morning, I found out that these were all useless studies because he had been like that for 3 days.” (P5)</td>
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<td>Code status (5)</td>
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<td>“There was a patient who I was cross covering who ended up crashing and it was not verbally conveyed or written in the sign-out that the patient was not a full code. The patient was coded for over a minute… we were definitely doing chest compression before someone realized that the patient was not a full code.” (C2)</td>
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<td>Baseline status (2)</td>
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<td>“A patient was transferred to the ICU because it appeared that they were worse from the baseline. Of course we did not really know what the baseline was and it turned out that the patient had bad right sided heart failure which would have been helpful to know during the resuscitation as the patient was coding.” (C7)</td>
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<td>Rationale of primary team (5)</td>
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<td>“They appeared to be septic and I was unclear why the patient was not on antibiotics and it was not described or communicated on the sign-out why not. I ended up putting the patient on antibiotics but it was a difficult decision since I did not know the reasoning of the primary team.” (P6)</td>
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*Four of 21 worst events not represented here.
Without such guidance, variability in the performance and effectiveness of this communication is almost certain. One possible approach to address these problems is standardization. In fact, the implementation of standardized “hand-off” communications is a National Patient Safety goal identified by the Joint Commission on Accreditation of Healthcare Organizations. Although little evidence or instruction exists to inform such standardized practices, the taxonomy presented in table 6 can form the foundation of systematic and educational interventions to improve sign-out.28 One approach to standardization of written sign-out is the use of sign-out templates. These sign-out templates could include required fields for high yield content, such as code status, to prevent content omissions. A more technologically oriented approach to standardization described by others is a computer based system.21 22 A computer based system oriented approach to standardization described by others is a possible approach to address these problems is standardization.30

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<th><strong>Suggested improvements for verbal sign-out</strong></th>
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<td><strong>Category (n)</strong></td>
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<td><strong>Anticipate (5)</strong></td>
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<td><strong>Pertinent (2)</strong></td>
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<td><strong>Face-to-face (2)</strong></td>
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<td><strong>Thorough (1)</strong></td>
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<th><strong>Suggested improvements for written sign-out</strong></th>
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<tr>
<td><strong>Category (n)</strong></td>
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<td><strong>Patient content (13)</strong></td>
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<td><strong>Overall features (8)</strong></td>
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*More than one category and sub-category mapped to these 20 distinct suggestions for improvements.*
This study has several limitations. Firstly, it examines the sign-out processes of a group of interns at one teaching hospital. Because of variability between institutions in mechanisms of sign-out or coverage systems, this study is limited in the extent to which it is generalizable. However, given the frequency of sign-out, these findings do enhance the limited existing literature by providing a framework and method for evaluating communication failures in this process. Secondly, these findings are subject to limitations of the critical incident interviews. It is possible that expectation-led interviewer effects, although reportedly minimal, may have influenced the data collection. These effects, which occur when the interviewer may inadvertently influence respondents to produce outcomes consistent with a priori expectations, would manifest itself as an increase in the number of communication failures reported. However, given the reliability and predominance of categories that emerged, it is less likely that the distribution of types of failures would change significantly. It is also equally possible that the identity of the interviewer (in this case a former chief medical resident) may have influenced data collection. These failures often lead to uncertainty in decisions about patient care which may result in inefficient or suboptimal care.

A taxonomy of effective and poor sign-out is presented which may be informative in designing educational and system-based interventions to improve the quality of sign-out.

ACKNOWLEDGEMENTS

The authors thank Vivian Chang, Carrie Dunphy, and Jennifer Higa for their excellent research assistance.

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This research was supported by the Department of Medicine at the University of Chicago.

None of the authors has any competing interests.

APPENDIX 1: STRUCTURE OF INPATIENT GENERAL MEDICINE SERVICE AT UNIVERSITY OF CHICAGO

The general medicine inpatient service consists of eight teams of one attending, one resident (second or third year house staff), and two interns (first year house staff). Teams are designated by a letter (A, B, C, or D) and number (1 or 2). Teams designated with the same letter perform their required extended duty hour shifts (“call”) on the same day, every fourth day. These extended shifts are from 8 am to 8 am the following day, at which time the intern is “post-call”. During the on-call period, interns designated with the same number are responsible for caring for patients on the other three teams in their assigned numerical group after those teams leave the hospital. For example, intern A1 takes call on Monday with intern A2, but is responsible for all of the patient care (also known as “cross-coverage”) for interns B1, C1, and D1 after those interns leave the hospital.

The official transfer of care between the primary intern to the covering intern, who is on-duty or “on-call”, takes place through both a handoff process known as “sign-out”. This sign-out can refer to the verbal communication at the time of the handoff and/or to the written Microsoft Word document that contains a synopsis of the primary intern’s patients. The next morning, primary interns return from home and contact the covering intern, who is now “post-call”, to retrieve their
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REFERENCES


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Qual Saf Health Care 2005 14: 401-407
doi: 10.1136/qshc.2005.015107

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