

Signout Fallout

February 1, 2018

Starmer AJ, Landrigan CP. Signout Fallout. PSNet [internet]. 2018.

<https://psnet.ahrq.gov/web-mm/signout-fallout>

Case Objectives

- Understand the role of communication failures in medical errors and preventable adverse events.
- Review the evidence in support of handoff improvement programs and their associated impact on medical errors and patient safety.
- Describe the role of closed-loop communication in patient handoffs.
- Consider the value and benefits of direct observation of handoff skills in the workplace.
- List important steps that support the successful implementation of a handoff improvement program.

The Case

A 43-year-old woman with a history of atrial fibrillation was brought to the hospital with altered mental status and found to have an intracranial mass with a surrounding hemorrhage. She was intubated for airway protection and managed in the intensive care unit (ICU). She was monitored clinically and with daily CT scans of the brain. Fortunately, for the first 3 days, her exam remained unchanged, and the bleeding was stable on repeated CT scans.

On hospital day 4, the ICU team and the neurosurgeon decided it would be safe to start deep venous thrombosis (DVT) prophylaxis. They collectively decided that, if the CT scan that day remained unchanged, the benefits of low-dose DVT prophylaxis would outweigh the risk of serious bleeding. The senior resident on the neurosurgical service told the intern during the day that "heparin should be started if the CT scan is unchanged," but didn't specify the dose or route of the heparin. The intern did not ask any follow-up questions about the plan. At the end of the day, the intern signed out to the overnight on-call resident to "start heparin if the CT scan is unchanged."

The on-call resident reviewed the CT scan with the radiology resident overnight and they agreed it was stable. He then briefly reviewed the records and saw the history of atrial fibrillation and decided the day team must have wanted to treat the patient with full-dose anticoagulation (rather than lower dose anticoagulation, appropriate for venous thromboembolism prophylaxis). He ordered full-dose anticoagulation with a heparin infusion.

About 2 hours after starting the infusion, the patient became more obtunded. A repeat head CT scan showed a significant increase in the intracranial hemorrhage and worsening brain compression. The heparin infusion was stopped, but the patient continued to worsen over the next few hours. Based on the extent of the bleeding and her neurologic examination, she had no chance for a meaningful recovery. After discussions with her family, care was withdrawn, and she died with her family at her bedside.

The neurosurgical attending and the ICU attending met with both of their teams to discuss what happened. They identified many errors but were particularly concerned about the miscommunication regarding what was signed out to the overnight provider. With their local graduate medical education office, they initiated a literature review and began quality improvement efforts to embrace best practices in signout.

The Commentary

by Amy J. Starmer, MD, MPH, and Christopher P. Landrigan, MD, MPH

As is often the case when a death occurs due to a preventable adverse event in hospital, a series of errors contributed to the tragic outcome described above. Also typical of such sentinel events, a breakdown in communication among the team of providers caring for this patient was one of those errors, and perhaps the one that could have been most readily prevented. A more explicitly described contingency plan regarding the exact dose and route of heparin to be initiated if the CT was normal at the time of patient handoff or further questioning (closed-loop communication, or a synthesis) from the receiving provider (the on-call resident) could have prevented this adverse event from occurring.

Miscommunication has consistently been identified as one of the leading causes of serious adverse events in hospitals. Almost half of all sentinel events—defined as "an unexpected occurrence involving death or serious physical or psychological injury, or the risk thereof" (1)—reported to The Joint Commission (G. R. Castro, written communication) in 2016 involved handoff (handover) failures. Consequently, improving handoff quality has been identified by the Agency for Healthcare Research and Quality, The Joint Commission, the Accreditation Council for Graduate Medical Education, and other regulatory agencies as a leading patient safety goal.

Handoffs occur in the hospital every time providers change shift and whenever a patient changes locations. Omissions of critical information or provision of outdated, erroneous information occurs frequently.(2) Several developments in the health care system have exacerbated handoff problems, including the increasing complexity of hospitalized patients (3) and the introduction of trainee work hour reductions in response to studies demonstrating the hazards of excessive work hours.(4)

Historically, efforts to improve handoff practices had largely been directed at implementing narrowly focused interventions, for example, introducing a team training program or a new computerized handoff tool, but not both. A paucity of high-quality data existed demonstrating the effectiveness of any of these handoff improvement approaches. A 2013 systematic review of 36 studies found few objective data to inform a strategic approach to improving handoffs, as most studies relied on nonvalidated provider surveys alone, with little collection of objective data on effectiveness.(5) In the past few years, however, data on the effectiveness of strategies designed to reduce handoff errors has accumulated rapidly.

Drawing on the lessons from major patient safety successes that had implemented a bundle of complementary interventions to tackle complex patient safety problems (e.g., catheter-related bloodstream infections), our group hypothesized in 2008 that implementing a bundle of interventions to improve handoffs would be more effective than addressing any single aspect of handoff failures in isolation. In other words, rather than trying out a new computerized handoff tool, a new teamwork training program, or narrowly addressing interruptions of oral handoffs, we thought that developing a bundle that combined multiple small interventions might be the best approach. In a single institution pilot project, we rigorously measured the effects of such a bundle through: (i) comprehensive, prospective daily surveillance for medical errors, using a well-established data collection methodology; and (ii) direct observation of handoffs and resident workflow (time–motion analysis). Implementation of the bundle was associated with significant reductions in handoff miscommunications and reductions in serious medical errors, without any adverse effect on resident workflow.(6)

Using this work as a foundation, the I-PASS Study Group was formed and led a multicenter project in which a refined handoff bundle was implemented in nine pediatric residency programs in leading teaching hospitals in the United States and Canada from September 2010 to August 2013.(4) The handoff bundle consisted of six major complementary components organized around "I-PASS" (I: Illness Severity, P: Patient Summary, A: Action List, S: Situation Awareness and Contingency Plans, S: Synthesis by Receiver)—a mnemonic designed to help residents remember the key elements of the handoff process that the literature suggested were essential for reliable handoffs, but were frequently omitted.(7) The handoff bundle also included the following components (8):

- A workshop on the I-PASS Handoff Method and other teamwork and communication skills;
- A printed handoff document based on the I-PASS structure;
- A simulation session using roleplay to practice handoffs;
- A structured observation program to assess the quality of handoffs in the clinical workplace and provide feedback to individual residents and drive implementation and adoption;
- A faculty development program to teach faculty supervisors the I-PASS Method and to do assessment observations;
- A process- and culture-change campaign to support adoption and sustainability.

Following implementation of the I-PASS program across all nine sites, errors that harmed patients (preventable adverse events) fell 30% (4.7 vs. 3.3 per 100 admissions, $p < 0.001$), and near misses or nonharmful medical errors fell 23% (24.5 vs. 18.8 per 100 admissions, $p < 0.001$). Evaluation of verbal and written handoffs demonstrated significant gains across 14 out of 14 process measures ($p < 0.001$ for all 14 measures). Time–motion analyses demonstrated that this improvement was accomplished without any time cost; resident time conducting handoffs, time at the bedside, and time at the computer all remained unchanged.(9) The I-PASS handoff approach has subsequently been adapted with success for use by additional specialties (e.g., internal medicine [10], nursing [11], emergency medicine [12]) and additional provider types (e.g., medical students [13]).

A central hallmark of I-PASS and other high-quality handoff communication programs is the emphasis on closed-loop communication techniques. Handoffs of care involve the transfer of information, responsibility, and authority of medical decision making from a sending to a receiving provider. Receiving providers

therefore play a key role in the process of information transfer by confirming receipt of key information and asking clarifying questions to ensure shared understanding. In the case above, had the receiver (the on-call resident) synthesized and verbally summarized the key action steps and associated contingency plans, the sending provider might have been provided more specific information, clarifying that low-dose heparin should be initiated given the history of recent intracranial hemorrhage.

An additional challenge in providing high-quality handoff communication often lies in the need to determine what level of detail is necessary in the verbal handoff and in the printed handoff document (the Patient Summary, Action List, and Situational Awareness and Contingency Plans). For example, a more senior provider or a provider who has previously cared for the patient may require fewer details. In the same way that a medical student must learn to crisply synthesize while avoiding key omissions of a patient's medical history for presentation on morning rounds, so too must an intern over time improve handoff communication skills. At a programmatic or systemic level, workplace-based assessment of handoffs skills, using direct observation tools, offers an opportunity to provide feedback to support this learning.⁽¹⁴⁾ Such tools could be used to provide feedback on the degree of detail in the handoff communication. The tools may also be used to provide evidence that faculty and training programs are monitoring and ensuring the effectiveness of patient handoffs.

An additional benefit of a direct observation program is the opportunity to generate quality improvement data. In the above case, a positive outcome of the incident was the decision to leverage graduate medical education and quality improvement resources within the institution to try to prevent such handoff failures from occurring in the future. While multiple elements must be put into place to implement a successful handoff improvement program, key steps include the following:

- Establish institutional support for the initiative and ensure adequate organization and leadership of the handoff improvement team;
- Conduct a needs assessment of the local environment to understand existing areas of vulnerability and anticipated barriers to implementing;
- Train all frontline providers in best handoff practices;
- While implementing a common format to reduce variation in handoff quality, concurrently consider the need to adapt evidence-based handoff programs for use in particular units, specialties, and disciplines;
- Determine the scope of implementation and develop an implementation plan, including workplace-based observation and feedback;
- Ensure ongoing data collection and iterative improvement cycles.

Because handoff processes become entrenched in institutional culture, efforts to improve them require more than just training, assessment, and feedback. A robust commitment to cultural change is needed, as are the time and resources required to effect such a change. However, with adequate planning, anticipation of potential barriers, and teamwork, it is possible to achieve transformational change as well as improved handoff quality and reductions in handoff-related adverse events such as the event described in the above case.

Take-Home Points

- Communication and handoff failures are a leading root cause of sentinel events and medical errors.
- Multiple strategies have been shown to improve the quality of handoff communication including mnemonics, computerized handoff tools, training programs, and workplace-based assessment.
- The implementation of a bundled intervention including multiple handoff improvement strategies in the I-PASS Handoff Program has been associated with a 30% reduction in rates of preventable adverse events.
- Teamwork, planning, and anticipation of resistance to change are key components of successful handoff improvement efforts.

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Faculty Disclosure: Drs. Starmer and Landrigan hold equity in and serve as consultants and board members for the I-PASS Institute. Neither the commentary nor continuing medical education activity includes information regarding any commercial products or investigational or off-label use of pharmaceutical products or medical devices.

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This project was funded under contract number 75Q80119C00004 from the Agency for Healthcare Research and Quality (AHRQ), U.S. Department of Health and Human Services. The authors are solely responsible for this report's contents, findings, and conclusions, which do not necessarily represent the views of AHRQ. Readers should not interpret any statement in this report as an official position of AHRQ or of the U.S. Department of Health and Human Services. None of the authors has any affiliation or financial involvement that conflicts with the material presented in this report. [View AHRQ Disclaimers](#)