Understanding and Improving Patient Handoffs

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“The wide diversity of handoff quality measures suggests a lack of consensus about the primary purpose of handoffs and how best to intervene to improve handoff processes.”
—Patterson and Wears (page 59)
Editorial

Handoff Improvement: We Need to Understand What We Are Trying to Fix

Erik Van Eaton, M.D.

Too often in the hospital, we hear that important information or tasks “just fell through the cracks” after a transfer of patient care. Yet this analogy is wrong. The problem with transfer of patient care is that it is not a clear pathway with some dangerous cracks that need fixing. Patient handoffs in medicine are astonishingly variable,1,2 with no prespecified purpose or structure other than to “maintain continuity of care” or to provide enough input to the next care area to support a good outcome. Most residents are not trained in handoffs and learn the technique by modeling equally unskilled peers. It’s no wonder the process is called a “peculiar ritual”—unscientific repetitive behavior with no guaranteed outcome.

In this issue of *The Joint Commission Journal on Quality and Patient Safety*, Patterson and Wears expose this uncertainty and complexity in a review that explores all the objectives that inpatient handoffs could accomplish.3 These researchers, mindful of clinical needs, group these functions into seven categories, or framings, and suggest outcome measures for each framing. Those interested in improving handoffs will realize after reading the article that we cannot simply “improve handoffs” with a checklist or some training. We must instead review our handoff processes. Relevant improvement will only come after understanding that different clinical scenarios require different handoffs. Each handoff must be reviewed, dominant framings discovered, and changes thoughtfully designed to fit work flow and be measurable. Several of the authors’ measures are things that care providers do or remember during busy clinical work. Those who use this review’s important framework in a careful handoff redesign must beware of focusing too many interventions on the workers at the sharp end while failing to overhaul handoff conditions and supporting tools that are created in the organization’s upper echelons—where more lasting improvements ought to be made.5,6

An example of one such supporting tool is described in the article by Anderson et al., also in this issue.7 This software application provides a readable, reliable, and complete, yet not overwhelming, supply of information from an outgoing care provider to the incoming replacement. The authors helpfully mention, in passing, an early failure during testing: “significant problems with function.” Including irrelevant information during a handoff converts what should be a helpful quick-reference summary into an unhelpful, overdense recapitulation of progress notes. As others have commented, merely applying structure to information does not improve communication or care quality.9 Finally, although not statistically significant, 50% more survey respondents said after implementation that handoffs occurred in a quiet place. It is unknown from this report whether sites deployed the software tool in conjunction with a handoff redesign that included other improvements—which, for real progress, as Patterson and Wears would say, would be required. Applying computerized automation to a broken or ill-defined process simply results in a broken computerized process.9

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References

Numerous quality improvement projects on patient handoffs have been conducted in the last decade. In part, these projects have been motivated by hospital and training program accreditation requirements in the United States. The Joint Commission’s 2006 National Patient Safety Goal, which required “a standardized approach to hand-off communications,” is now scored as a standard.\(^1\) In addition, the Accreditation Council for Graduate Medical Education (ACGME)’s limit on resident physician duty hours,\(^2\) effective July 1, 2007, has had the effect of increasing physician handoffs for patients.\(^3\)–\(^6\) In addition, the World Health Organization has published a Patient Safety Solution for ‘Communication During Patient Handovers’,\(^7\) and the Society of Hospital Medicine has endorsed a set of recommendations for hospitalist handoffs.\(^8\)

There is a growing awareness that high-quality handoff processes are critical to providing safe and effective patient care.\(^9\)–\(^15\) Approximately 20%–30% of information conveyed during handoff updates is not documented in the medical record.\(^16,17\) Impacts of less-than-ideal handoffs likely include adverse events,\(^18\) delays in medical diagnosis and treatment, redundant communications, redundant activities such as additional procedures and tests, lower provider and patient satisfaction, higher costs, longer hospital stays, more hospital admissions, and less effective training for health care providers.\(^19\) Several observational, focus group, and survey studies have confirmed that the baseline condition for patient handoff processes is highly variable in quality and structure.\(^20–28\)

Given the dramatic increase in activity to improve patient handoff processes, it is surprising that standardized, reliable measurement tools remain elusive.\(^29\) We believe that the wide diversity of quality measures in the handoff literature suggests

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**Article-at-a-Glance**

**Background:** Numerous quality improvement projects on patient handoffs have been conducted, yet standardized, reliable measurement tools remain elusive.

**Handoff Quality Measures Classified by Primary Handoff Purpose:** The literature review, which yielded approximately 400 relevant articles, led to the identification of seven primary functions for patient handoffs, each of which implies different interventions to improve them: (1) Framing 1, information processing is the most prevalent in the patient handoff literature; (2) Framing 2, stereotypical narratives, emphasizes highlighting deviations from typical narratives, such as a patient who is allergic to the preferred antibiotic for treating his or her diagnosed condition; (3) Framing 3, resilience, takes advantage of the transparency of the thought processes revealed through the conversation to identify erroneous assumptions and actions; (4) Framing 4, accountability, emphasizes the transfer of responsibility and authority; (5) Framing 5, social interaction, considers the perspective of the participants in the exchange; (6) Framing 6, distributed cognition, addresses how a transfer to a new care provider affects a network of specialized practitioners performing dedicated roles who may or may not be transitioning at the same time; (7) Framing 7, cultural norms, relates to how group values (instantiated as social norms for acceptable behavior) in an organization or suborganization are negotiated and maintained over time.

**Discussion:** The diversity of handoff measurement approaches suggests a lack of consensus about the primary purpose of a handoff, as well as about what interventions are most promising for improving handoff processes. Recognizing that there are simultaneously multiple purposes for handoffs is a critical precursor to quality improvement.
confusion and disagreement about what patient handoffs are intended to accomplish. To aid health care personnel tasked with measuring the impact of changes to patient handoff procedures, we have classified the literature on possible handoff measures by seven primary purposes of a handoff. We discuss how these different definitions suggest different types of interventions to improve handoffs, and specifically counsel against interventions based solely on the dominant conceptualization of a patient handoff as an information processing task.

Methods
The literature review was conducted in three waves, primarily in October 2008, with small reviews conducted in October 2009 and December 2009 to find recent publications, in electronic databases (PubMed, Google Scholar) using search terms, using forward and backward citation searches from key articles, and by requesting papers from researchers. Approximately 400 relevant articles were identified. Related terms discovered during this review included handoffs, handovers, sign-outs, sign-overs, turnovers, intershift transfers, intershift handovers, shift change transfers, patient transfers, transitions of care, transfers of care, substitutions, bedside reports, shift reports, shift-to-shift communications, shift-to-shift reports, discharges, discharge communications, discharge summaries, discharge notes, post-operation updates, interdisciplinary transfers, multiprofessional handovers, and admissions. Existing literature reviews discovered during the search process provided many of the referenced citations.

Handoff: A Working Definition
Our working definition for a patient handoff is as follows: “The process of transferring primary authority and responsibility for providing clinical care to a patient from one departing caregiver to one oncoming caregiver.” Caregivers include attending physicians, resident physicians, physician assistants, nurse practitioners, registered nurses, and licensed practitioner nurses. It is assumed that the patient handoff is conducted between caregivers at comparable levels of experience and expertise and who are at equivalent levels of a hierarchy (for example, attending physician to attending physician). The scope of this article does not include handoffs across differential levels of staffing, such as from a primary caregiver to an on-call provider; handoffs for short periods of time (for temporary relief of nursing coverage during a 15-minute break); handoffs across specialties (anesthesiologist report to postanesthesia recovery room nurse); handoffs across settings (from the emergency department [ED] to the intensive care unit [ICU]); or handoffs between professional health care providers and family caregivers (discharging from a hospital setting to an in-home setting).

Examples of handoffs using this definition are as follows:
- Nursing shift changes
- Physician sign-outs
- Physician-to-physician transfers during a tour of duty to balance workload
- Nurse-to-nurse transfers during a shift to balance workload

Following a handoff, the oncoming caregiver assumes the responsibility for providing care, as defined in Table 1 (page 54).

Handoff Quality Measures Classified by Primary Handoff Purposes
On the basis of the literature review, we have identified seven primary framings for patient handoffs, each of which has a primary function that implies different interventions to improve handoffs (Table 2, page 55). This framework is based on our synthesis of the existing literature, informed by others’ distinctions and extends our previous framework. We have limited our discussion of handoff functions to one per conceptual frame, although it is likely that there are multiple functions for some of the framings. We have classified the handoff measures into these seven functions (Table 3, page 55).

Framing 1: Information Processing
The first framing, information processing, is the most prevalent in the patient handoff literature. The Joint Commission, in defining the primary objective for a handoff, used this framing, as follows:

The primary objective of a “hand off” is to provide accurate information about a [patient’s] care, treatment, and services; current condition and any recent or anticipated changes. The information communicated during a handoff must be accurate in order to meet [patient] safety goals.

The conceptual framing is based on an information processing metaphor that has dominated scientific thought for decades and is represented as a sequence of four mental operations: (1) encoding, (2) comparison, (3) response selection, and (4) response execution. These operations occur inbetween inputs (stimuli) to an individual and outputs (responses) from an individual and mediate the use of memory and attentional resources. With this frame, the primary function of the handoff is to transfer data through a noisy communication channel (that gets noisier with background noise, interruptions, infor-
Table 1. Oncoming Caregiver’s Responsibilities for Care Following a Handoff

| 1. Performing technical work competently |
| 2. Knowing the historical narrative (relevant patient history and chief complaint) |
| 3. Being aware of significant data or events |
| 4. Knowing what data are important for monitoring changes and their associated levels of uncertainty |
| 5. Managing impacts from previous events |
| 6. Anticipating future events |
| 7. Weighing trade-offs if diagnostic or therapeutic judgments need to be reconsidered |
| 8. Planning patient care strategies |
| 9. Performing planned tasks |
| 10. Alerting others to the completion of interdependent tasks |
| 11. Supervising junior personnel and/or accessing senior personnel |
| 12. Identifying warranted and avoiding unwarranted shifts in goals, priorities, plans, decisions, or stances towards key decisions |
| 13. Relationship building with peers and other social functions |
| 14. Articulating and reinforcing group values |
| 15. Protective functions, including supporting other caregivers who are grieving for dying patients |
| 16. Involving patients and their family caregivers in decision making |


Interventions to minimize interruptions are usually based on this conceptual framing in that reduced interruptions are believed to improve information transmission by reducing the background noise in a communication channel and also by reducing memory loss of both the departing and oncoming practitioner. Interventions include conducting handoffs in a quiet, dedicated space away from main traffic areas and using noninterruptive communication strategies, such as dedicated pagers for noncritical patient requests or delegating answering the phone to a clerk, during the handoff update.

As indicated in Table 3, the primary measurement approach with this framing is to compare the content of the handoff update (based on a verbal transcript or analysis of handwritten or electronic paperwork) against a “gold standard” of essential content. In addition, distinctions are made between information transmitted by the departing provider during the update and retained information by the oncoming provider after the update. Extensions of this approach include weighing some items as more important than others and/or separately reporting critical information and optional information. For example, one article recommends splitting information provided by emergency medical service to ED personnel during a handoff update into (1) information that is essential to stabilize and initially diagnose the patient and (2) information that is needed to treat the patient over the long term.

An extension of this measurement approach is to rate whether information has been organized in a particular fashion, such as that based on a Situation-Background-Assessment-Recommendation (SBAR) ordering. Alternative ordering schemes include physical locations in beds and patient ordering (often alphabetic by last name) on information technology systems, by “most important first,” by body system, by head-to-toe ordering, or by patient problems.

This measurement approach can be further categorized into essential content that is designed to apply across a wide range of settings versus content that is tailored to a particular setting, such as from an anesthesiologist in the operating room to a nurse in the postanesthesia care unit or from a surgical physician to a surgical physician. In defining what is essential,
there are challenges in striking a balance between comprehensiveness of information and directing attention toward particularly salient issues (which can be easily missed under data overload conditions and/or when a standardized format makes it difficult to highlight unusual information). Additional trade-offs include minimizing the work to tailor a list to a particular setting, coordinating with other hospitals on standards, meeting the needs of different disciplines, allowing flexibility for contingencies, and maintaining lists over time, in particular removing items from lists to avoid having the lists become unwieldy (a common pattern is to frequently add and rarely remove handoff items).

An alternative approach is to measure content omissions or recalled information. A related observational measurement approach that is more subjective but reduces analytic time and that can be done in real time by a single observer is to rate conveyed content on an acceptability scale or a scale that qualitatively estimates the level of structure in the update. Similar approaches that use self-report from handoff participants ask about satisfaction with handoffs, perceived quality, whether a transfer was suboptimal or poor, whether a problem or critical incident could be attributed to an inadequate transfer, whether one or more patients experienced harm from problematic handoffs in a physician’s most recent rotation, and whether there were any surprises during the subsequent shift.

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Table 2. Alternative Functions of a Handoff

<table>
<thead>
<tr>
<th>Conceptual Frame</th>
<th>Primary Function</th>
<th>Intervention Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Information Processing</td>
<td>Transfer data through a noisy communication channel</td>
<td>Standardized handoff protocol</td>
</tr>
<tr>
<td>2. Stereotypical Narratives</td>
<td>Label by stereotypical narrative and highlight deviations</td>
<td>Daily goals for interdisciplinary teams</td>
</tr>
<tr>
<td>3. Resilience</td>
<td>Cross-check assumptions with a fresh perspective</td>
<td>Two-challenge rule for resident physicians questioning attending physicians</td>
</tr>
<tr>
<td>4. Accountability</td>
<td>Transfer of responsibility and authority</td>
<td>Handover protocol that explicitly assigns tasks to team members</td>
</tr>
<tr>
<td>5. Social Interaction</td>
<td>Co-construction of shared meaning</td>
<td>Supporting interdisciplinary team communications during rounds</td>
</tr>
<tr>
<td>6. Distributed Cognition</td>
<td>Replace a member of a network of specialized practitioners</td>
<td>Shared repository artifact (e.g., whiteboard) for aiding coordination between caregivers</td>
</tr>
<tr>
<td>7. Cultural Norms</td>
<td>Negotiate and share group values</td>
<td>Guided reflection on handoff improvements during resident orientation</td>
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</tbody>
</table>

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Table 3. Examples of Quality Measures for Handoff Functions

<table>
<thead>
<tr>
<th>Conceptual Frame</th>
<th>Quality Measures</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Information Processing</td>
<td>Accurate essential content transferred</td>
<td>Information units transferred</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Information omissions</td>
</tr>
<tr>
<td>2. Stereotypical Narratives</td>
<td>Appropriate patient narrative Insightful summary synthesis</td>
<td>Level of information abstraction</td>
</tr>
<tr>
<td>3. Resilience</td>
<td>Collaborative cross-checking (accuracy of diagnosis, quality of treatment plan)</td>
<td>Risk-adjusted mortality and morbidity Preventable adverse events</td>
</tr>
<tr>
<td>4. Accountability</td>
<td>Task completion Inappropriate tasks transferred</td>
<td>Dropped patients</td>
</tr>
<tr>
<td>5. Social Interaction</td>
<td>Respectful interactions, team climate Generation of new insights</td>
<td>Interprofessional communication quality</td>
</tr>
<tr>
<td>6. Distributed Cognition</td>
<td>Effective coordination of care</td>
<td>Technical errors</td>
</tr>
<tr>
<td>7. Cultural Norms</td>
<td>Educational interventions Policies and procedures Changes in priorities, values, acceptable behaviors</td>
<td>Comfort with doing handoff Number and quality of implemented process changes</td>
</tr>
</tbody>
</table>
Outcome measures could theoretically be employed with any conceptual framing. Because information processing is the dominant frame in the handoff literature, most of the attempts to measure outcomes have been done with this framing. To date, most of the studies have compared naturally occurring “A versus B” groups rather than randomly selected groups or pre–post comparisons. Examples include additional transfers to a cross-covering physician,69 coverage by a physician from another team,7 short-call and cross-coverage,7 and information technology support versus no information technology support for handoffs.76 Patient outcome measures include risk-adjusted mortality and morbidity,71 cardiac arrests, preventable adverse events,78 length of stay (LOS), patient satisfaction, malpractice claims, timeliness of care, timeliness of disposition to hospital, boarding times in the ED, staff retention, staff satisfaction with technology support versus no information technology support for handoffs.76 Patient outcome measures include risk-adjusted mortality and morbidity,71 cardiac arrests, preventable adverse events,78 length of stay (LOS), patient satisfaction, malpractice claims, timeliness of care, timeliness of disposition to hospital, boarding times in the ED, staff retention, staff satisfaction with technology support versus no information technology support for handoffs.76

Framing 2: Stereotypical Narratives

The second framing, stereotypical narratives, takes advantage of the narrative structure to quickly and effectively communicate large amounts of information by associating the information with default patient narratives.74–75 With this framing, the emphasis during the handoff is on highlighting deviations from typical narratives, such as a patient who is allergic to the preferred antibiotic for treating his or her diagnosed condition.

A fictional example of a handoff update from a departing to an oncoming nurse is provided in Sidebar 1 (right). An example of a stereotypical narrative for this patient is “A postmenopausal woman with late-stage breast cancer who mostly needs help with self-care activities.” Deviations from this stereotypical narrative for this patient include “The patient has a cardiac history that affects her speech ability, has recently lost a lot of weight due to frequent vomiting, is at risk of falling when she is mobile, and frequently asks nurses for aid.”

The Pronovost et al.76 daily goals intervention for interdisciplinary teams in the ICU uses typical patient narratives and deviations in a prominent fashion. A similar approach would be to ask an oncoming provider to summarize what was learned from the handoff update and provide an outline of a plan to either the departing provider or to a supervisor, immediately following which the departing person is encouraged to make any clarifications or provide additional information.

Measures for this framing include the accuracy and completeness of retained information about relevant patient history and chief complaint74 or the level of synthesis and abstraction of the provided information; one measure is the Recognition-Primed Abstract Decomposition Space (RP-ADS), which was used by Miller and colleagues to find that nurse handoffs focused more on data and intervention levels, whereas physician handoffs focused more on diagnoses and expectations.77

Framing 3: Resilience

The third framing, resilience, involves taking advantage of the transparency of the thought processes revealed through the conversation to identify erroneous assumptions and actions.78/79 For example, during a (fictional) face-to-face nursing handoff update at the conclusion of a shift, the departing nurse says, “She is able to get up and go ad lib to the bathroom.” Then the oncoming nurse says, “No, that’s not right. I took care of that...”
patient yesterday. The physician ordered her to be on strict bed rest because she tried that by herself and nearly fell down because she was so weak.” The departing nurse then says, “Oh, I didn’t know that. Now that I think about it, I don’t think she went to the bathroom all night, but be sure to let the family know that today.” Even when errors are not detected, clarifying questions can be asked to confirm an understanding, such as for the oncoming nurse to ask, “So the plan is to discharge this morning?” and for the departing nurse to respond, “No, first his blood pressure has to come down, so you’re probably looking at late afternoon at the earliest.”

Interventions to institute check-out procedures that provide the opportunity for the oncoming provider to ask clarification and error-detection questions, even when the handoff update is audiotaped or handwritten, is an example with this frame. Although not specific to handoffs, the two-challenge rule for resident physicians questioning attending physicians that encourages error-detection questioning strategies is a related concept.60 In army aviation, the rule is defined as follows:

The two-challenge rule allows one crew member to automatically assume the duties of another crew member who fails to respond to two consecutive challenges. For example, the pilot-on-the-controls becomes fixated, confused, task overloaded or otherwise allows the aircraft to enter an unsafe position or attitude. The pilot-not-on-the-controls first asks the pilot-on-the-controls if he is aware of the aircraft position or attitude. If the pilot-on-the-controls does not acknowledge this challenge, the pilot-not-on-the-controls issues a second challenge. If the pilot-on-the-controls fails to acknowledge the second challenge, the pilot-not-on-the-controls assumes control of the aircraft.81(p. 15)

Measures for this conceptual frame are the number of clarification and error-detection questions posed by the oncoming provider during a handoff62 (and potentially evidence of other collaborative cross-checking strategies used in high-risk industries such as having oncoming providers initiate new topics and “overhearing” by interdisciplinary colleagues to identify misconceptions63) and increases in patient harm. For patient harm, the same outcome measures described for Framing 1, information processing, would be used. The main difference is that rather than assuming an increase in harm due to lost information during the transition,63 there is hypothesized to be a decrease in harm because of the opportunity for the oncoming provider to critique the departing provider’s diagnosis and treatment plan, which could allow earlier detection and recovery from errors.63

FRAMING 4: ACCOUNTABILITY

The fourth framing, accountability, emphasizes the transfer of responsibility and authority that distinguishes a handoff update from an information update. Interventions to ensure that patients are assigned to providers, that providers are aware and have accepted the transfer,84 and that others are aware of who is responsible for a patient and reminders to complete tasks that have been handed off, such as checking on laboratory results, relate to this framing. One redesign of a handoff instantiated in a protocol format62 included explicitly assigning specific tasks to team members, such as assigning ventilation to the anesthesiologist.

Measures for this frame include the number of dropped patients (defined as patients who are assigned to departing providers but are not assigned to oncoming providers following the handoff update)64; transfer of inappropriate tasks and/or failure to complete activities before the end of a shift65,66; and having legible, accurate, and up-to-date documentation.

One concern with accountability considerations is whether changes to handoff procedures are accompanied by a shift in power.67 Therefore, we suggest avoiding interventions that are intended to shift power from front-end workers to more distant administrators and regulators, such as requiring additional data entry in systems to justify deviations from recommended practices such as appropriate beta-blocker use.67

FRAMING 5: SOCIAL INTERACTION

The fifth framing, social interaction, emphasizes how a handoff allows a co-construct of essential meanings and co-orientation toward that essential meaning on the basis of knowledge of the perspective of the participants in the exchange.68 All communicative acts include both a content dimension and a relational dimension, which reinforces social relationships between parties. For example, a departing physician in the ICU could provide a handoff update to an oncoming physician that describes the plan for determining between two potential diagnoses for the patient, which includes several blood draws. The nurse could overhear the interaction and request that an arterial line be inserted if multiple laboratories requiring blood draws are planned to make it more comfortable for the patient. The oncoming physician agrees to this request by the nurse, also mentioning that this would also provide an opportunity to mentor the medical student in the procedure. The handoff discussion between the physicians then continues while the nurse can again overhear the conversation, with the oncoming physician suggesting an alternative third possibility for the diagnosis that could be ruled out with a magnetic reso-
nance imaging (MRI) test of the lung. The nurse then rejoins the discussion and comments that the patient’s lung sounds this morning during assessment might indicate some problems for which an MRI might provide insight.

Interdisciplinary handoffs that include both physician and nursing personnel would be an intervention with this framing. A literature search on interdisciplinary handoffs uncovered no articles measuring the impact of implementing these kinds of handoffs.

Therefore, the intervention example we provide is not specifically for handoffs, but rather for rounds, where attempts were made to explicitly support interdisciplinary team communications and to take the different perspectives into account (in some cases including the patient and caregivers).89

Measures associated with this frame are quality of interpersonal communication,90 respectful body language,91 the willingness to wait to begin the handoff until both participants are ready to engage fully in the interaction (for example, the anesthesiologist waits until the patient’s airway is unobstructed before providing the handoff to the nurse in the postanesthesia care unit), and whether new insights emerge from the handoff communication, such as new potential diagnoses or treatment plans to pursue.

**FRAMING 6: DISTRIBUTED COGNITION**

The sixth framing, distributed cognition, addresses how a transfer to a new care provider affects a network of specialized practitioners performing dedicated roles who may or may not be transitioning at the same time. Updates need to be provided to the network about when the transfer has occurred and whether the contact information and/or strategy needs to be changed, along with the individual as well as parallel updates to the oncoming provider about what oncoming providers have replaced departing providers.

Interventions with this framing include making accurate, up-to-date contact information easily accessible92; using whiteboards (or other “shared repository artifacts”) to aid coordination between caregivers93; and clarifying who has primary responsibility and authority for a patient, such as by handing over pagers or cell phones for use in a particular role (charge nurse, nurse, on-call physician, code team) at the conclusion of a handoff update to signal that the responsibility has transferred.

Measures for this frame include time to contact an intended provider, number of “re-routes” to other personnel before obtaining access to a specialist, the accuracy of information on a shared repository as compared with other information sources, and technical errors due to teamwork interactions.94

**FRAMING 7: CULTURAL NORMS**

The final framing, cultural norms, relates to how group values (instantiated as social norms for acceptable behavior) in an organization or suborganization are negotiated and maintained over time. Socialization about “how things are done here” during on-the-job orientation can include practices for conducting handoffs, and thus training interventions of cultural change interventions can spread beyond the directly involved individuals. Alternatively, the “hidden curriculum”94 can undermine policies, procedures, and training if what is documented and taught differs from what is learned during an apprenticeship period in the local work environment.

Interventions with this framing include providing sufficient organizational support to conduct handoffs, such as by reducing multiple concurrent tasks,95 by allocating a dedicated time for handoffs, having adequate staffing and/or supplemental staffing during the transfer such as with short-term coverage by nurse managers, overlapping shifts and avoiding short shifts with minimal staffing, having personnel personally hand off to the oncoming person, and handing off on-call responsibilities like responding to codes before the transfer to reduce the likelihood of having to cut off the update before it is completed.

Another category of intervention is educational initiatives on how to conduct handoffs.96,97 Unfortunately, there is little guidance on how to measure the impact of educational initiatives in general. One measurement approach following a traditional one-hour class setting to teach effective communication skills during verbal sign-out handoffs to medical students and residents was to do a pre-post within-subject comparison of perceived comfort with providing sign-out.98 Simulation-based courses that teach recommended handoff practices can be assessed as to whether the practices, or “acceptable” modifications, are adopted in the actual work setting using direct observation. Guided-reflection techniques, where audio or video clips are used to stimulate group discussion, can be judged as to what previously unrecognized issues and associated suggestions for handoff process improvement are identified and/or lead to process improvements.99,100 Similar measurement strategies can be used for regular administrative reviews of transfer processes,100 the appreciative inquiry technique where the staff were asked to discuss and build on their most effective handoff experiences,101 and new definitions for professionalism that incorporate the quality of transfer processes.102

**Discussion**

In the last decade, numerous quality improvement projects on patient handoffs have been conducted, and clearly there
remains much interest in improving on the baseline for patient handoff processes across the industry. Nevertheless, our review and classification of the handoffs literature do not enable us to make recommendations for the use of any particular standardized, reliable measurement tool.

We believe that the wide diversity of handoff quality measures suggests a lack of consensus about the primary purpose of handoffs and how best to intervene to improve handoff processes. We also believe that all of the conceptual framings that we have identified are potentially useful, compatible framings and that there might be others that we have missed. As work moves forward, clarifying and elaborating alternative conceptual framings for the purposes of handoffs should enable us to make progress on developing useful measures to objectively assess handoff quality.

Nevertheless, we and others caution against narrowly defining a handoff based solely on a single conceptual frame, the dominant information processing metaphor for communicating information accurately in a noisy channel. The dominance of the information processing measures in this review and the many calls to standardize the information content of handoffs suggest to us that there is a fundamental miscalibration about how much content standardization and content ordering is desirable or even possible. For us, a patient’s course of illness as compared to stereotypical patterns; detection of erroneous assumptions and plans; the environmental context, including work load and the number and character of “hanging” tasks following the transfer; the social context and background of the handoff participants; team interactions; and cultural norms about acceptable behavior would inform the definition of what is “insightful” to include in a particular patient handoff interaction.

References


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Communication breakdowns are cited as the root cause for the majority of sentinel events in hospitalized patients, and the lack of detailed knowledge about patients and poor communication of plans to cross-covering physicians is predominant among causes of decreased quality of care.\(^1\)\(^-\)\(^3\) Communication errors commonly occur during “handoffs,” defined by The Joint Commission as the “real-time process of passing patient-specific information from one caregiver to another or from one team of caregivers to another for the purpose of ensuring the continuity and safety of the patient’s care.”\(^4\) For all accreditation programs, National Patient Safety Goal 2E, in effect through 2009, stated that hospitals should “implement a standardized approach to ‘handoff’ communications, including an opportunity to ask and respond to questions” with “opportunity for discussion between the giver and receiver of information.”\(^4\) The Joint Commission has also recommended that the receiver of information have opportunity to review relevant patient data, that information be up to date with a process to verify information, and that interruptions be limited.\(^4\) The Joint Commission’s requirement for a standardized approach to handoff communications is now Element of Performance 2 (“The hospital’s process for hand-off communications provides for the opportunity for discussion between the giver and receiver of patient information”) for Standard PC.02.02.01 (“The hospital coordinates the patient’s care, treatment, and services based on the patient’s needs”).\(^5\) The Department of Veterans Affairs (VA) has made similar recommendations,\(^6\)\(^,\)\(^7\) yet standardized methods for patient handoffs remain rare for physicians.\(^8\)

Many industries, not only health care, have complex, interconnected, event-driven, time-pressured, and resource-constrained systems with the potential for serious consequences for system failure. Strategies have been designed to address these issues.\(^9\)\(^-\)\(^10\) The current literature suggests that successful handoffs in health care should include the following vital information: contact information for the primary team, complete patient identification data, active problem list, pertinent past medical...
history, current condition, active and updated medication and allergy lists, code status, anticipated changes in the next care interval with a recommended course of action, and psychosocial concerns that may influence therapeutic choices.\textsuperscript{9,11–14} In addition, some have advocated listing the acuity of the patient, cognitive status, cardiopulmonary status, information on venous access, discussions on level of care and listing long-term plans in case families have questions overnight, pertinent laboratory data, pending tests, consults, and procedures.\textsuperscript{9,2,14}

Previously surveyed physicians considered two main categories of communication failures to be most important: “content omissions,” in which critical information was not communicated, and “failure-prone communications processes,” including lack of face-to-face communication and illegible handwritten notes that often omit information because of an unwillingness to rewrite information daily. In addition, commission of information, with inclusion of irrelevant information, has also been cited as a cause of poor handoffs.\textsuperscript{13–15}

To help reduce these communication process errors, standardized electronic medical record (EMR)–linked handoff tools may be a powerful asset. Yet few EMR–linked handoff tools are currently available. Computerized handoff systems have been demonstrated to reduce poor handoff through improving information completeness, legibility, and accuracy, and are preferred by residents to handwritten handoffs.\textsuperscript{15–19} Computerized handoffs have also been reported to improve patient safety in regard to the frequency of adverse events between cross-covered patients and primary team–covered patients, by decreasing patients missed on rounds and improving perceptions of quality of sign-out and continuity of care.\textsuperscript{2,20} Moreover, many hospitals in the United States use handoff systems that are not secure (for example, e-mail, unencrypted word-processing documents) to save handoff lists from day to day. Furthermore, there are many barriers to effective handoffs, including the physical setting (for example, distractions, background noise), the social setting (senior resident communicating with junior resident), language and communication barriers, and constraints on time;\textsuperscript{3} with potential loss of vital information occurring with each handoff.

Although software based on housestaff needs in a solitary hospital\textsuperscript{17} and a large hospital system has been shown to improve patient handoff,\textsuperscript{21} a single software package has not been previously developed and tested in diverse geographical regions. Therefore, we conducted an evaluation to develop and test in diverse geographical regions within the VA health care system a secure EMR–linked handoff tool to improve the quality of the physician-to-physician handoff in terms of completeness, content quality in terms of consistency of information transfer, legibility, data security, between-physician communication, and physician acceptance with and efficiency of the handoff process.

**Methods**

**Phase I. Analysis of Existing Handoff Tools**

To determine the actual information conveyed in writing by physicians and ensure that content deemed important to physicians was included, we performed data collection and analysis, as now described.

**Abstraction of Handoff Sheets.** Before implementing the handoff software, handoff sheets used by internal medicine physicians rotating at participating VAMCs were collected at the end of shifts on a voluntary basis as part of a quality improvement initiative. Participation in this process was optional, with three of the initial seven sites invited in February 2006 choosing to participate. Because of the voluntary nature of this endeavor, an attempt was not made to collect all possible handoff sheets during this time period.

Handoff sheets were abstracted to identify the following vital information: code status, medication lists, allergy lists, complete patient identification and location data (floor, room number), and format (typed or handwritten.) Items could be either present or absent for each individual patient. Medication lists were coded as present if any portion of the list was present. Format was used as a surrogate for legibility. Tasks handed off to cross-cover physicians to do during their shift and problems encountered by the covering physician were also abstracted as text. Anticipated changes in the next care interval with a recommended course of action and psychosocial concerns—information that is frequently conveyed orally without a written form—were not abstracted. Although considered important aspects of patient handoffs, abstraction was not performed regarding primary team contact information, pertinent medical history, current condition, or problem lists, as confirmation of completeness and accuracy of these items was not possible.

**Survey of Residents’ Perceptions of Current Handoff Methods.** To inform the design of the handoff software, the software development team (including J.A., P.K.) surveyed internal medicine residents rotating at participating VAMCs regarding their perceptions of current handoff methods before the handoff software was introduced. The questionnaire was designed to test physician perceptions of handoff quality and efficiency by soliciting themes present in the literature and through modification of previously used surveys. The questionnaire included six domains: (1) quality and safety, (2) complete-
ness and legibility, (3) user acceptance and usability, (4) efficiency, (5) physician communication, and (6) communication with nursing.

The questionnaire responses used 5-point Likert scales and free-text comments. For purposes of data presentation, “strongly agree” and “agree” were combined, as were “disagree” and “strongly disagree,” with “neutral” as a separate category. Anonymous questionnaires (as both paper-based and Web-based instruments) were distributed pre- and postimplementation to a convenience sample of resident physicians who had recently been assigned to the medicine wards. Because some residency program directors were unwilling to share the names of their residents, we were not able to track the responses or the total numbers of potentially eligible physicians to determine accurate response rates.

**Phase II. Handoff Tool Design and Development**

**Design.** Informed by the analysis of existing handoff methods and questionnaire responses, current literature, and opinions rendered by an expert consensus panel of clinicians and information technology (IT) personnel, the VA Office of Patient Care Services in January 2006 charged a consensus panel—composed of the software design team, programmers, and IT personnel—with the design of an EMR–linked handoff software program to address Joint Commission National Patient Safety Goal 2E. The handoff software was based on a program originally developed at the Roudebush VAMC (Indianapolis) in 1999, with continual improvements as indicated by feedback from end users.

**Development and Testing.** In February 2006, seven geographically diverse VAMCs initially participated in software development and testing. At each site, the medical center director was contacted, and physician and IT champions were named. In April 2006, the Indianapolis VAMC distributed the software to four of the initial seven facilities. (Not all seven sites were able to implement the software because of restrictions on the availability of IT personnel and the use of unproven computer software applications). Biweekly teleconferences were held with all parties to discuss the software, with identification of functionality issues, troubleshooting of software capabilities, and sharing of solutions. Continuous monitoring at the test sites ensured the tool contained the content desired. At the individual hospital level, the handoff software was managed by the IT personnel managing the EMR system.

By August 2006, six of the seven facilities were testing the software. However, because of significant problems with functionality (for example, difficulties in forming the handoff list, propagating the DNR [do-not-resuscitate] orders, printing) all facilities ceased using this version of the handoff software by the end of the month. In September 2006, a face-to-face meeting was held with staff from participating VAMCs to discuss how to make the handoff tool better (including making the software more user-friendly and printing more patients per page) and how to interface better with orders for the VA’s existing EMR, the Computerized Patient Record System (CPRS), while maintaining patient safety. At this meeting, the group agreed on functionality features for the revised handoff tool, with the updated version installed initially at one site in February 2007. After troubleshooting issues at the initial test site, the software was released to the remaining sites at the end of that month. In March 2007, after the initial sites were successfully using the handoff software, word of mouth created interest in the program, and several additional sites joined testing. In total, 12 VAMCs participated in testing prior to approval for national release in October 2007. Before national distribution, enabling of the software application for use by handicapped persons was tested in April 2008 by two of the initially testing sites and two sites new to the software to ensure functionality in diverse settings. During a 26-month period (February 2006 to May 2008), the handoff tool was tested at a total of 14 sites to assess usability, ease of installation, or unanticipated problems. Software distribution throughout the United States occurred in June 2008. All VAMCs were required by the VA central office to install the software with optional implementation; forced change was not thought to increase user buy-in of this software package, and some facilities already had standardized methods of handoff in place. In an effort to increase voluntary participation, submission of postimplementation data was not required because of the burden it would create on the individual sites not involved with the initial project.

The majority of VAMCs (the exact numbers are unknown) have adopted the software, with use in internal medicine, surgery, and psychiatry. Security of the electronic handoff software is password protected using the CPRS system, with routine software management performed by the local IT departments managing the EMR. Consistent with the current standard, printed handoff reports are to be disposed of in secure fashion after use.

**Tool Features.** The handoff software for the shift handoff tool, with the on-screen display (Figure 1, page 65) and the printing display (Appendix 1, available in online article), automatically draws information from the CPRS, with mandatory fields as displayed in Table 1 (page 66) and multiple optional
free-text fields. The system was designed to prevent omission of vital information and improve patient safety while at the same time create a product that facilitates the process of patient handoff between health care providers. The software automatically imports demographic data (for example, patient name, social security number [SSN], age, floor location), code status, and medication and allergy lists, and these items are automatically updated from the CPRS to reflect current orders. Contact information for the primary team (attending, intern, resident, and student, with pager and phone numbers) is updated by end users to reflect continuously rotating service schedules and is stored until edited.

The design allows up to four blank fields where pertinent past medical history, current clinical course, “to-do” lists, and other items (for example, specialist consults, discharge planning, imaging and laboratory data) can be included. The blank fields are free-text boxes, which are site- and specialty-configurable, with a forcing function requiring the information to be updated within a set period, after which information not updated will be assumed obsolete and automatically deleted. Although it is possible to automatically import the assessment and plan from the daily progress note into the handoff tool, free-text boxes were used to convey these data in an effort to limit printed handoff length. Data automatically imported from the EMR is not modifiable by users, and thus error cannot be introduced into the handoff unless orders are erroneously entered into the CPRS. Medication lists were standardized to name of drug only without dosage, route, or other information to save space on the printed form and are not modifiable by users to prevent incomplete information from appearing complete.

**PHASE III. EVALUATION**

Following the same process as described above for Phase I, the handoff sheet collection and content analysis was repeated in March 2007 after software implementation. Three sites elected to participate. The evaluation phase also involved repeating the physician questionnaire.

**Code Status.** Because it is uncommon to order “full code” status, the accepted assumption was to default care to full code if no code status information was provided. The software development design team chose to propagate the field with “Code Status Not Found” if not otherwise specified. This statement was intended as a safety reminder to physicians to confirm the patient’s code status. If there was any mention of code status (for example, full, DNR, “Code Status Not Found”), it was coded as present.

**Participants.** Although 12 geographically diverse sites across the United States initially tested the functionality of the handoff software, only 4 sites (large East coast metropolitan teaching hospital, 2 medium-sized Midwestern teaching hospitals, a large Southern teaching hospital) fully participated in the optional pre- and postimplementation questionnaires, with 3 additional sites participating pre-implementation. Three sites participated in the handoff sheet collection both pre- and postimplementation; however, only 2 sites (large East coast metropolitan teaching hospital, medium-sized Midwestern teaching hospital) collected sheets at both pre- and postimplementation. To reduce uncontrollable bias, only the sites that participated both pre- and postimplementation in the handoff sheet collection and/or questionnaire were included in the analysis. However, pooled results from the additional sites did not significantly differ from the reported results. For missing
questionnaire responses, the denominators were based on the number of nonmissing answers.

Data Abstraction. Data abstraction was performed by two staff physicians [J.A., A.C.]. Interrater reliability for the first 69 handoff tool abstractions showed a high level of agreement ($\kappa = 0.92$), so that abstraction of the remaining 894 patient handoffs was performed by a single clinician [J.A.] and not repeated.

Data Analysis. Pearson’s chi-square test or Fisher’s exact test was performed to evaluate change in pre- and postimplementation responses for categorical variables. The Student’s $t$-test was performed to analyze continuous variables. All analyses were performed using SAS statistical software, version 9.1 (SAS Institute; Cary, NC). The Institutional Review Board at the University of Iowa and the Iowa City VA Medical Center Research and Development Committee approved this study.

Results

PRE-IMPLEMENTATION HANDOFF TOOL CONTENT ANALYSIS

Before implementation of the handoff software, 550 patient handoffs were abstracted (Table 2, page 67). When medication lists were present, they frequently appeared incomplete by visual inspection (for example, no mention of intravenous [IV] fluids, only a few medications listed on an acutely ill patient). No attempt was made to quantify the number of missing medications in a partial list; however, partial lists were counted as present. Nearly all handoffs were typed and printed for portability with word processing software, spreadsheets, and handwritten documents utilized. The most frequent handoff tasks included follow-up of test results or consult recommendations and management of ventilation, blood sugar, and blood pressure. Other tasks included checking on specific patients, performing procedures, confirming medication administration/discontinuation, ordering diets, checking line placement, and patient transfers.

Handwritten comments by covering physicians included changes in patient condition, loss of IV access, restraint orders, blood transfusions, falls, laboratory abnormalities, urinary catheters, medication errors, order clarifications, refusal of services, poorly communicated plan for patient discharge, participating in family discussions, and failure of tests to be performed despite orders. One death was noted.

POSTIMPLEMENTATION HANDOFF TOOL CONTENT ANALYSIS

Postimplementation of the handoff software, 413 patient handoffs, all of which were produced by the EMR–linked handoff tool, were abstracted (Table 2). Physician requests for items to be done by covering physicians were similar to preimplementation handoff sheets, as were handwritten comments made by covering physicians; however, fewer covering physician comments were noted. Overall improvements from pre- to postimplementation in handoff content regarding consistent presence of information transferred were found for all vital information categories. Some site-specific variation was noted.

### Table 1. Required Fields for the Physician Shift Handoff Tool*

<table>
<thead>
<tr>
<th>Fields</th>
<th>Comments</th>
</tr>
</thead>
</table>
| 1. Pertinent past medical history and current clinical course | - Free-text entry that is visible in the handoff tool for the entire inpatient stay and is editable daily  
- Forcing function requires information to be updated manually within a period of time (e.g., 7 days) or it will be assumed obsolete and automatically deleted.  
- Time/date of last update in field included |
| 2. Code status | - Information imported from CPRS orders  
- Reported as “Code Status Not Found” if no orders are found regarding code status |
| 3. Allergies | - Information imported from CPRS  
- Reported as “not known” if not entered into CPRS |
| 4. Current medications | - Imported from CPRS listing active medications alphabetically by name without dosage, route, or other information |
| 5. To-do list | - Free text entered daily as needed with same forcing function as Field 1 |
| 6. Demographic data | - Imported from CPRS: full name, SSN, age, gender, floor, team, room/bed, admission date, days of care |
| 7. Header information | - Team name with name and contact information for attending physician, interns, residents, and students |

*CPRS, Computerized Patient Record System; SSN, Social Security Number.
PRE- AND POSTIMPLEMENTATION QUESTIONNAIRES

The results, reported in Table 3 and Table 4 (page 68), are summarized by survey domain.

Quality and Safety. The four statements related to handoff quality and safety all improved from pre- to postimplementation (Table 4). The percent of respondents who agreed or strongly agreed that their handoff system “optimizes patient safety” increased from 44% to 84% (p < .01); only one respondent disagreed with this statement postimplementation. Perceptions that the “handoff quality is excellent” and perceptions of both omissions and commission of information also improved.

Pre-implementation free-text responses mentioned lack of minimum standards for handoff information and concern with commission and omission of information. The majority of these responses noted that quality of handoff communication was primarily dependent on the physicians involved. Weekends were frequently mentioned as a time for poor handoffs because of care provided by physicians unfamiliar with the patients. One respondent mentioned that postimplementation handoff quality was improved because there were “no errors” with automatic importation of data already present in the patient chart.

Completeness and Legibility. Respondents stated that a written handoff must be easy to read. Before implementation of the handoff tool, the majority of abstracted patient handoffs were typed. Notably, the software testing sites not choosing to participate in the data collection portion of the project reported mixed handoff methods that involved both handwritten and typed patient lists. There was a 24% postimplementation improvement to 90% agreement (p = .03) with the statement that the handoff is “easy to read.”

Pre-implementation free-text responses related to physician communication indicated that respondents wanted to know demographic information, code status, active issues, current clinical condition, what to do if expected scenarios occur, abnormal and pending tests, medication and allergy lists, recent vital signs, IV access status, and family contacts. With the exception of vital signs, IV access, and family contact information, all were added to the handoff tool during Phase II through automatic data importation, with free-text boxes for pertinent clinical history and a covering shift “to do” list.

User Acceptance and Usability. Common themes included a
Table 4. Pre- and Postimplementation Responses for the Six Questionnaire Domains

<table>
<thead>
<tr>
<th>Domain</th>
<th>Pre-implementation</th>
<th>Postimplementation</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Quality and Safety</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The current system optimizes patient safety (p &lt; .01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Handoff quality is excellent (p &lt; .01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Information necessary to provide good patient care is omitted (p &lt; .01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>There is too much information on the handoff (p &lt; .03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>2. Completeness and Legibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handoff is easy to read (p &lt; .03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>3. User Acceptance and Usability</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The current handoff system is easy to use (p &lt; .03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>There is sufficient space to hand write comments on the sign-out sheet (p &lt; .03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>4. Efficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handoff method I use is familiar (p &lt; .01)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>5. Physician Communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feel prepared to care for patients handed off to me when I am on call (p &lt; .03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>6. Nursing Communication</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I feel comfortable handoff patients to the covering physician (p &lt; .02)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>When I receive a patient handoff, in general I understand the plan of the outgoing physician (p &lt; .02)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>When I hand off patients, in general I feel that my plan is understood by the receiving physician (p &lt; .20)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Handoff occurs in a quiet place (p &lt; .03)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Verbal report is given on all unstable patients (p &lt; .72)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Verbal report is given on all patients (p &lt; .74)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Verbal report is given in the same format each time (p &lt; .82)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>I use if then statements when signing out tasks (p &lt; .73)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Nursing staff understand the plan for the patient at time of physician handoff (p &lt; .35)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>I would like the handoff tool to be available to nursing staff (p &lt; .85)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>Strongly Agree</td>
<td>Neutral</td>
<td>Disagree/Strongly Disagree</td>
</tr>
<tr>
<td>Post</td>
<td>Strongly Agree</td>
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Efficacy. Free-text responses pre-implementation indicated that physicians were accustomed to the current handoff process. However, many physicians requested a standardized handoff system that automatically imports and updates information from the EMR to improve efficiency. There was significant postimplementation improvement in the perception that the handoff system is “efficient” (p < .01). As shown in Table 3, from pre-implementation (n = 63) to postimplementation (n = 51), respondents reported a nonsignificant mean decrease of 14.1 minutes spent at the computer to type their handoffs (41.2 minutes versus 27.1 minutes; p = .20) while caring for the same mean number of patients (7.0 versus 6.9; p = .13), for a nonsignificant decrease in computer time from 3.3 to 2.6 minutes per patient (p = .16).

Physician Communication. As shown in Table 4, postimplementation, respondents reported improvements in “feeling prepared to care for patients” received in handoff (p < .03) and in understanding “the plan of the outgoing physician” at time of handoff after use of the handoff software (p < .02). The statements “my plan is understood by the receiving physician” and “feeling comfortable handing off patients to the covering physician” each had a nonsignificant increase in agreement.

There was no change in the reported amount of time in face-to-face handoff communication (13.4 versus 12.7 minutes; p = .19; Table 3).

Nursing Communication. Responses to questionnaire items related to nursing communication, including the item “Nursing staff understand the plan for the patient at the time of physician handoff,” were not affected by the new handoff software (Table 4). Free-text responses about making the handoff accessible to nursing staff indicated some apprehension with concerns that “nuisance” calls from nursing staff would increase and that the handoff sheets could be saved to “use against physicians” should something go wrong. Respondents were also concerned that if given access to the physician handoff, nursing staff “may make assumptions regarding the patient and [make] changes in his/her status without contacting [the physician].” Respondents also felt that giving nurses access to the handoff might create more confusion, especially if care plans were misinterpreted and then discussed with patients. Interestingly, an approximately equal number of respondents were in favor of allowing nursing staff access to the physician handoff.

Discussion

There is considerable variability in information content transferred during handoffs, and lack of standardization may lead to omission of vital information such as code status and patient location. The few studies that have examined the handoff process confirm that users are dissatisfied with current handoff systems, which they find to be variable, unstructured, and prone to error.11,15,21,22

Through abstraction of paper handoff sheets and responses to housestaff questionnaires, our evaluation demonstrated the handoff software was associated with fewer omissions of vital information without causing commission of information and could be configured to automatically import and update data from the EMR. The questionnaires suggested that the handoff tool was well received by users and that it improved perceptions of quality and safety of patient care, efficiency, and comfort with the patient handoff. The variability in percentages of baseline data available on the handoff sheets between sites, as well as the feedback obtained during conference calls, demonstrates that the new handoff software can be adopted at diverse locations with overall improvement in handoff quality, even at locations with a standardized handoff method.

For physician communication, there was a high level of communication at baseline, which was essentially unaffected by use of the handoff software. Because of concern that an EMR–based handoff tool could lead to less face-to-face communication, it is notable that no such postimplementation
change was observed. Nor did perceptions of communication with nursing change with implementation of the software. These measures provide some validity to the questionnaire because we would not expect verbal handoff practices or perceptions of communication with nursing staff to change on the basis of use of a standardized handoff software program for physicians.

Because physician handoffs are not part of the permanent medical record, it is not the norm for these written documents to be available to nursing staff. Questionnaire responses indicated that some physicians were apprehensive about allowing nursing staff access to their handoffs, whereas others welcomed the idea. Emerging evidence suggests that both nursing satisfaction and nursing perception of patient care quality are improved with provision of the written physician handoff to nursing staff, without adverse consequences to physicians. In addition, more than half of physician training programs do not have a way to let nurses know about transfers of care. Nursing access to the physician handoff eases confusion related to shift change, improving both nursing satisfaction and patient care. The question of nursing access should be further investigated and considered with future refinements to the handoff software.

Our findings support the perception that variability adversely affects handoff quality in terms of both omission and commission of information. Residents were generally concerned with the variable quality and quantity of information provided in patient handoffs and wanted more concise communication. The design team elected to force users to type pertinent information regarding patients’ clinical course into free-text fields instead of importing directly from the daily progress note. This was intended to prevent omission of information and excessively long handoff reports while creating a flexible system capable of including data elements unique to a given patient. Anecdotally, the decrease in handwritten comments after use of the handoff software suggests that covering physicians encounter fewer unexpected scenarios during their shifts. It has been stated that a “disadvantage of electronically linked systems is the inability to tailor data to the critical data elements for the given patient.” Yet the handoff tool design includes the necessary elements to prevent omission of vital information while at the same time providing flexibility in information provided.

Our findings also support previously published literature that existing handoff methods are frequently incomplete and demonstrates a need for improvement at shift changes. The amount of time required to prepare and execute the handoff directly influences its content, and although the decrease in self-reported time to complete the handoff sheet did not reach statistical significance, both objective measurement of handoff content quality and perception of quality improved, with less time invested per patient.

Limitations
There are a number of limitations of our evaluation that should be considered. First, we restricted our analysis to only the academic-affiliated VAMCs for which complete data were present, thus limiting generalizability of the results. Yet, data from additional sites (we collected handoff sheets from two additional sites and obtained questionnaires from three additional sites) supported our overall conclusions. In addition, all sites that participated in the project provided ongoing feedback during the regular conference calls and through e-mail. Another limitation is that it is not possible to know if omissions in handoff communications discovered in this study led to harm in patient care. When evaluating pre-implementation handoff sheets, no attempts were made to quantify the accuracy or completeness of information, including medication lists. However, in addition to being more frequently present, medication lists appeared to be more comprehensive with use of the handoff software. An unexpected finding that not all fields automatically entered by the handoff software were 100% present after software implementation (Table 2) was attributed to programming errors in the software that have since been corrected. Finally, although we were able to demonstrate objective improvements in consistency of information transfer, adverse events directly attributable to poor handoffs are rare and difficult to evaluate and collect, so that our evaluation necessitated the use of surrogate quality measures.

Summary
The new handoff software improved both consistency of information transfer and perceptions of patient handoff within the VA health care system. Although the tool focuses on the handoff between physicians at shift change, other potential applications of the software include daily team rounds and enhancement of communication between nurses and physicians. A final version of the handoff software was incorporated into the CPRS and made available in June 2008 to all VAMCs.

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Online-Only Content

See the online version of this article for
Appendix 1. Shift Handoff Tool: Display for Printing

References

24. Doyle E.: To keep nurses in the loop, this hospital gave them access to its computerized rounding and sign-out system. Today’s Hospitalist, pp. 20–23, Jul. 2006.
When patient information is complete, a printout is generated to facilitate the handoff and to be a resource for the covering physician.