High-Hanging Fruit: Improving Transitions in Health Care

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Abstract

Discussions about enhancing the safety of transitions in health care have been disjointed. Respected health care researchers, noting handoffs to be variable in content and process, view improving handoffs as "low-hanging fruit" that can be easily gathered by reducing variability through standardization in a variety of ways. In contrast, human factors specialists express concern about potential unintended consequences of this approach, particularly when it is applied across a wide variety of practitioners and settings, due to factors common to complex domains with high consequences for failure. These factors include the ubiquity of goal conflicts and trade-offs in chronically under-resourced environments; the understanding that imposing simple standards on complex processes will never yield simplicity; and the recognition that communication is not a single function but rather a means to achieve multiple functions in distributed work. Standardization can enhance handoffs, not in the manner commonly espoused in health care, but rather by providing a window of opportunity to restructure how they are normatively conducted. For example, standardization by employing a rigid structure for the content of a verbal update is potentially misguided compared to an adaptive heuristic of "triage (most important first), tell the story, and details on demand."

Introduction

Transitions in care bridge gaps in health care work that are a consequence of its continuous operation (24 hours x 7 days) and its divisions of labor. These divisions have long been viewed as necessary evils, fertile ground for error, and opportunities for failure.[1, 2, 3] The large number and wide variety of types of transitions in health care (e.g., like-to-like, like-to-unlike, across specialties) and the myriad contexts within which they occur markedly complicate understanding and attempts at redesign.

There have been three common approaches to transitions, each organized around what is perceived to be the predominate source of vulnerability:[4]

- One viewpoint assumes that the informal verbal format is a significant weakness, and that if information were presented in a standard, clear, and consistent format (either written or electronic), the process would markedly improve.[2, 5] It is strongly influenced by the information-processing metaphor of human cognition, where the emphasis is on completeness of data transmission.

- In contrast, a second perspective views the loosely structured verbal interaction as a strength, allowing health care workers to perform "real time decoding and synthesis," while responsibility and authority for patient care are being transferred.[6] This perspective stems from the belief that data availability is insufficient for effective "sensemaking" to understand the "story" of a patient's status and predicted future trajectories.
- The third position, based in the emerging "resilience engineering" literature, regards transitions as opportunities for reassessing situations for the explicit purpose of identifying and correcting hazards and failures.[7]

In this article, we discuss the role of standardization for enhancing the safety of health care transitions. In particular, we focus on the most frequently occurring transitions—shift change signovers and handoffs—and the importance of structuring flexibility into any improvement efforts for the preservation of existing but latent safety features.

Standardization

A national experiment is underway to "fix" transitions in health care.[8, 9] Remediation efforts for signovers have centered around the assumption that a high degree of variability in the method and content of information is a fundamental flaw in the process.[2, 5, 9] The currently popular modes include uniform patterns of contact in the form of scripting checklists, such as SBAR (Situation, Background, Assessment, Recommendation).

By definition, standardization can be beneficial to any communication process if it provides the "rules" for interaction, so they do not need to be negotiated (including the function, process, content, timing, and who is directly or indirectly included in the conversation); it allows information to be conveyed more efficiently and with higher reliability; and convention can be established, such that the lack of comment on a topic would imply (usually) that there is nothing worthy of mention. From a stance of transitions as "low hanging fruit," the benefits of standardization are understandably appealing.

The introduction of standardization to the signover process in this manner draws from an elementary understanding of the sociotechnical complexity of the work performed during the signover. Signovers provide more than information (e.g., name, blood pressure, diagnosis); they also support macrocognitive functions, such as problem recognition, problem analysis, sensemaking, and planning[10] (e.g., "If the temperature does not come down soon, she will need a CT scan and lumbar puncture, and her husband is very anxious about it.") None of these functions is easily conveyed in a structured format (e.g., checklist or scripted).

Written signovers or checklists. Standardization of clinical shift transitions via a written format has been widely recommended and employed,[11, 12] but there have been a number of unintended consequences. The implementation of a signover form has been observed to supplant verbal updates during times of work overload; forms that are sometimes "pre-prepared" call into question their validity.[13] Additionally, the role of these signover forms in the documentation of medical care is unclear. Should they be managed as a part of the medical record (discoverable following an unintended outcome), or are handoff forms and checklists merely cognitive work tools, no different than a "to-do" list for tracking tasks?

Danger also lies in the template becoming the script for transitions, thus changing the nature of the event from a "two-way interaction" to a "one-way transaction." Under increasing workload, it could be easy for the checklist to supplant the interactive aspects of a transition, becoming instead the script from which workers read; or worse, changing the criterion for a "completed" signover into the receipt of a form. In either case, the result would be a reduction in patient safety, with less inquiry and opportunity for clarification. This also undermines workers' macro-cognitive functions (i.e., problem recognition, analysis, sensemaking, and planning) and also the rescue and recovery opportunities that signover can provide.[14]

Written logs or report sheets are another method recommended for handovers in process operations. These have been observed to be routinely used prior to and/or following handover updates in most high-reliability organizations (HROs) as reference or cognitive artifacts for critical data points.[15] In some settings, including NASA space shuttle mission control, written logs contain a short summary to support the handover process but are not all-inclusive. The use of written and electronic cognitive artifacts has shown benefit within specific clinical care settings, such as transitioning to an overnight cross-cover clinician or team.[16, 17] Since it is hard to know what the equivalent of a "log" would be in most health care settings, new paperwork or software would have to be created for this type of transition improvement. Either medium would be required to briefly capture the "story" in a written format that could be easily referenced if needed.[18]

Standard verbal content. Standard ordering of verbal content in patient handoffs has been another implemented strategy for improving shift-change handoffs.[19] Observations of handover updates in other domains have noted an absence of scripting of discrete data elements,[7] most likely explained by the use of "most important first" as an ordering heuristic for topics in the verbal update.[20, 21] In addition, space shuttle mission controllers are reportedly trained to "efficiently communicate a bottom line and details when asked," which enables them to flexibly negotiate the level of detail needed in the update.[7]

Another benefit of ordering by "most important first" is a decreased likelihood that interruptions will occur prior to covering the most critical aspects of the update. Under data-overload conditions—where a massive amount of data is theoretically available but pragmatically impossible to review—the verbal update is used to help the incoming practitioner quickly get a "story" of the situation, which is not easily conveyed in a structured (checklist) format.[10] As yet, no HRO has been found to use a structured verbal update during a handover transition, including the frequently mentioned shift transitions on nuclear submarines (S. Kirschenbaum, R. Severinghaus, Naval Submarine Operations, personal communications, 2007). One way of characterizing the common elements of handoff updates in HROs is "triage, tell the story, and details on demand."

A consistent feature of signovers across industries is the fact that there is variation in both form and content,[22] which is likely a necessary consequence of the variable nature of the work being performed. Research on transitions in emergency medicine and nuclear power plants is illustrative of these variations.[20, 23, 24] Differences in content or genre of signovers related to the time of the changeover (morning, afternoon, evening) have been observed in both work settings, likely resulting from differences in the volume and character of work being performed (e.g.,

fewer major events on the overnight shift than during the daytime). Content exchanges also varied across skill levels (workers vs. supervisors in nuclear power; physicians vs. nurses).

Information exchanged as part of *in situ* problem solving and planning was observed in both physician and plant supervisor transitions, whereas situational and task updates were foremost in signovers involving plant workers and nursing staff. Shift changeover content appears to modulate based on recent events, the kind and complexity of current problems, the degree of uncertainty, time of day, and the team members present, as well as actual and anticipated competing demands for attention.[6, 25] Therefore, a single signover intervention cannot adequately support the work and safety of highly dynamic, complex work environments. The inevitable variation of work across health care must be attended to when attempting to standardize verbal content.

Readback. Another recommendation for patient handoffs has been the inclusion of readbacks.[11, 26] Readbacks in domains outside of health care are associated with very specific tasks, such as verifying discrete, numerically formatted information (e.g., acknowledging correct receipt of a planned altitude change in aviation). However, they have not been observed during HRO handovers, and their use during health care signovers remains equivocal.

Likely beneficial for discrete high-risk pieces of numerical information (i.e., lab values, medication dosing, or equipment settings), the global benefits of readback are less clear, given the true nature of the transitions.[26, 27] One explanation is that the ability to "read back" information does not verify synthesis and understanding, nor does it ensure remembering and performance of the task. Additionally, with verbal repetition, rather than written transmission of highly specific numerical data, there is a risk of "drift" similar to the phenomenon seen in the game of "telephone."[11]

A more general application of readback in signovers, though, is ill advised due to the high likelihood of diverting attention away from conveying the "story" of the situation to that of a periodic test of short-term memory, particularly if documentation specific to readbacks is required during an update.

A variation on readbacks, the "teachback," has been considered as a tool for including patients in the transition (P. Angood, personal communication, 2007). The word "teachback" emphasizes a divergent audience with variable levels of understanding of medical terminology and the work of clinical care. Additionally, teachbacks endorse the importance of educating patients about their clinical condition, including conveying treatment plans and any deviations, whether due to clinical or systems problems. Because of pragmatic challenges involved in timing a transition update to include patients, particularly when there are linguistic barriers (e.g., medical terminology, spoken languages) and cognitive barriers (e.g., dementia), the inclusion of patients "real-time" becomes unlikely. On the other hand, making plans observable to patients and caregivers, including through verbal interactions, might enable increased robustness across care transitions, particularly during discharges to the home setting.

Latent Properties of Transitions: "Hard-to-See Things"

Observational studies of transitions in health care have elucidated a number of latent or "hard-to-see" properties that are very similar to those in other industries.[28, 29] Four phases of transitions

have been noted: (1) pre-turnover, during which the individuals involved begin to prepare for transition; (2) arrival, where incoming and off-going workers gather; (3) meeting, during which the transition occurs; and (4) post-turnover or "taking post," during which oncoming workers assume authority and responsibility. These same phases have been observed during shift signovers in emergency medicine and during transitions of care that cross specialties.[6, 23] The presence of these phases supports the notion of transitions and signovers as intricate and richly constructed events that provide an opportunity for workers to assemble shared representations of their complex work environment, or to "co-orient."

Co-orientation theory, a model developed in the 1970s, has at its core the need for shared mental models for effective communication processes.[30] Transitions in continuous work environments, such as health care, are vehicles for off-going workers to create shared mental models with oncoming staff, "co-orienting" for future sensemaking and planning. Co-orientation is an implicit and latent feature of transitions, constructed during the two-way interaction of workers with an endpoint of reaching consensus or shared understanding of the issues.[31] The four phases of a transition provide a platform from which to co-orient for the identification of problems and issues, situation, and resource assessment; planning for the short and long term also can occur between workers at this time.[32]

Research on signovers in the nuclear reprocessing industry, anesthesia, and emergency medicine has identified transitions as occasions for highlighting not only failure, but also rescue and recovery.[14, 21] In these instances, the signover elucidated incorrect or incomplete problem identification and evolving unsafe conditions or plans.[33, 34] Signovers appear to provide a medium for "fresh eyes" to review the mental models used by off-going workers, in addition to the transfer of responsibility and authority to continue the work underway.

Fundamentals of Health Care Signovers Redesign

The burden of national improvement of transitions has become a local initiative delegated to individual health care organizations that subsequently have assigned the task to their workers. A benefit of the solutions coming from the "sharp end" of care is that they can be tailored to the clinical work setting, where the transitions occur, rather than being mandated from administration or external regulators. The downside is the lack of requisite expertise from human factors engineering, which might result in well-intended but not well-calibrated or well-understood interventions.

Calls for process standardization of transitions in health care abound, yet little research or science is being incorporated into the re-design.[35] Studies of transitions in other industries provide a rich collection of successful and failed strategies that would be applicable to transitions within health care based on demonstrated commonalities (such as the presence of the four-phase framework of shift signover noted above). The danger here then is two-fold: first, to avoid the "magpie syndrome"[36]—i.e., incorporating a strategy because it is "shiny and new" without a good understanding of its fundamental nature and underlying philosophy; and second, to avoid unintended consequences that could undermine latent safety features of health care transitions—"throwing out the baby with the bathwater."

It is essential to devise solutions thoughtfully. As in many other high-risk industries, the consequences of new implementations are not easily seen, take time to develop, and even then,

are not likely to be easily detected. Failure to invest time here runs the risk of undermining embedded safety features developed ad hoc to bridge the discontinuity of work.

Good design requires identifying fundamental elements and ground rules from which the deliverable can be crafted. The redesign of signovers and handoffs should begin with establishing transitions as non-optional behavior, viewed by the organization on a level with other initiatives, such as proper documentation or reducing patients' fall risk. Additionally, transitions must be synchronous, two-way interactions that include the health care worker who has the primary responsibility for the patient. This will allow opportunities for inquiry and clarification to support co-orientation and the construction of mental models for those assuming care. Finally, the goal for transitions should not be comprehensiveness, but saliency, to avoid swamping the important in a sea of the contextually immaterial.

Universal mandates to eliminate or reduce interruptions during handover updates are unlikely to be effective due to the typical length of transition updates and the high consequence, event-driven nature of health care. However, technologic support could provide for improved timing of interruptions. Pager and cell phone technology might offer an opportunity to negotiate the criticality of interruptions by giving users the ability to communicate their willingness to be interrupted (e.g., placing the cell phone or pager in one of several modes: Available; Busy; Call in 5 minutes, Emergencies only) that would be communicated or displayed to the caller upon first ring. The criticality of an interruption could be similarly encoded for the receiver by annotating calls or pages (e.g., FYI, When available, Respond in 5 minutes, ASAP, STAT).

An interesting strategy employed by most NASA space shuttle controllers is to remotely "listen in" to the primary audio channel ("voice loop") of the individual they wish to contact, allowing controllers to gauge whether their request is worthy of interruption and how to time the interruption.[37] This strategy might be copied if practitioners were willing to wear microphones that others could "listen in" on, or Global Positioning System (GPS) trackers that would allow others to "see" an individual's availability for an interruption, not only during transitions but also during other high-consequence activities, such as being in the operating room, in the middle of a procedure, or during a signover.

Additional ground rules for addressing communication issues in the health care setting can be found in the domains of communication and organizational theory.[11] These include: (1) limiting the impact of work place noise and other distracting interruptions; (2) limiting cognitive work load and if possible, physical work load (multitasking) during the transition period; (3) ensuring explicit communication between individuals as to who has responsibility and authority during the handoff; and (4) delaying documentation tasks until there is a reduction in high-consequence activities (e.g., medication administration or moving a critically ill patient to a higher level of care).[38, 39]

Observations of other high-consequence industries (e.g., railroads, ambulance dispatch, NASA Space Center) have found many of these same fundamentals in place.[40] Features that enhanced co-orientation in this these settings included providing time for the incoming staff to review the current state of operations before signover (i.e., brief overlap of shifts) and performing signover where other workers could overhear updates and provide correction as needed with limited external environmental noise. Intuitively, the implementation of these low-tech fundamentals for

effective communication would significantly affect handoff communication. It could be readily instituted at a local level with little impact on existing safety features currently embedded in signovers.

Conclusion

Improving the effectiveness of transitions in care is a complex endeavor; indeed, those who have been conscripted (i.e., health care workers) to improve care transitions are not fully aware of just how complex the task will be. Latent features of the handoffs, coupled with necessary variations to convey effectively the work at hand, reduce the presumed benefits from across-the-board standardization. Standardization is not a "silver bullet," and improving transitions is not a case of "low-hanging fruit."[41]

Introducing enhancements to existing processes—beginning with ensuring that handoffs occur between the practitioners directly caring for patients and are interactive in environments supportive of communication—are important first steps. Translating human factors principles and methods is not easy and should ideally involve multidisciplinary teams to tailor the transition to specific clinical areas.[35]

The introduction of limited, well circumscribed techniques at the "sharp end," such as ordering of content to "most important first," would allow for some enhancement of signovers while preserving critical features (i.e., co-orientation, problem recognition, sensemaking, planning, and opportunities for rescue and recovery). This approach would initiate the process of "fixing" transitions, as much needed research into understanding the messy details of clinical work gains traction.[42, 43]

The high hanging fruit
Hides all the sweetness you sought
In sour low-hangers
Wears-san

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