Implementing a Program for Early Recognition and Response to Sepsis

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“The key question for SERRI, as for all multicenter health care innovations, is the extent to which a complex intervention will have similar effects when its features are modified . . . so that it can be implemented in facilities that differ substantially along multiple dimensions.”
—The Sepsis Early Recognition and Response Initiative (SERRI) (p. 129)
Hospitals have struggled for a long time with the handoff process of communicating patient information from one health care professional to another. Communication was one of the top root causes of sentinel events that were reported to The Joint Commission from 2011 through 2013.1 Ineffective handoff communications has been a primary contributing factor in many studies of causes leading to medical errors.2–11 Joint Commission standards require hospitals to have an effective communication process to foster the safety of the patient and the quality of care.12*

Although the problems associated with ineffective handoff communications have been well documented in the literature, much of the work that has been done to address handoff communication–associated problems has focused on shift-to-shift rather than unit-to-unit handoffs, particularly handoffs coming from the emergency department (ED).13–15 ED handoffs, if not done well, are particularly vulnerable to medical errors because of their volume.14,16 Previous research on handoff communications from the ED, as reported by Ong and Coiera,13 addressed standardizing the handoff process and content, implementing a centralized repository for easy access to the patient information, aligning the handoff between different physician groups through education and guidelines, and increasing ED staffing levels to address high workloads.17–21 In an analysis of the nursing and physician literature on handoffs in hospitals, Hilligoss and Cohen found that the admission handoff was the central topic of only 9 of 640 published items and a secondary topic of 2 others.22,23

From our review of the literature, as summarized earlier, three key findings became evident. First, there were no recent studies with strong evidence indicating a linkage between handoff communications and solutions with outcomes.7 Second, much of the

**Teamwork and Communication**

**Using the Targeted Solutions Tool® to Improve Emergency Department Handoffs in a Community Hospital**

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**Article-at-a-Glance**

**Background:** There is little evidence for solutions to improve the handoff process between units, particularly from the emergency department (ED) to the inpatient unit. A systematic approach was used to improve the handoff communication process between the ED and the four private physician groups serving Juneau, Alaska, that admit and deliver care to patients of a 73-bed, Level 4 trauma center community hospital.

**Methods:** Data were collected in using the Joint Commission Center for Transforming Healthcare’s Targeted Solutions Tool® (TST®) to determine the rate of defective handoff communications and the factors that contributed to those defective handoff communications. Targeted solutions were then implemented to specifically address the identified contributing factors.

**Results:** A random sample of 107 handoff opportunities was collected during the baseline phase (November 4, 2011–January 12, 2012) to measure performance and identify the contributing factors that led to defective handoffs. The baseline handoff communications defective rate was 29.9% (32 defective handoffs/107 handoff opportunities). The top four contributing factors, together accounting for 69.8% of all the causes of defective handoffs, were inaccurate/incomplete information, method ineffective, no standardized procedures for an effective handoff, and the person initiating the handoff, known as the “sender,” lacks knowledge about the patient. After implementation of targeted solutions to the identified contributing factors, the handoff communications defective rate for the “improve” phase (April 1, 2012–July 29, 2012) was reduced from baseline by 58.2% to 12.5% (13 defective handoffs/104 handoff opportunities), \( p = 0.002 \); 2-proportions test). The number of adverse events related to handoff communications declined as the handoff communications defective rate improved.

**Conclusion:** Use of the TST was associated with improvement in the ED handoff communication process.

* Provision of Care, Treatment, and Services (PC) Standard PC.02.02.01: The hospital coordinates the patient’s care, treatment, and services based on the patient’s needs. Element of Performance (EP) 1: The hospital has a process to receive or share patient information when the patient is referred to other internal or external providers of care, treatment, and services. EP2: The hospital’s process for hand-off communication provides for the opportunity for discussion between the giver and receiver of patient information.
research focused on implementation of standardized procedures, including checklists, regarding the “critical elements” needed for the handoff, with contributing factors such as organizational structure and social factors unaddressed. Third, findings regarding shift-to-shift handoffs might not be generalizable to the very different nature of unit-to-unit handoff communications, which would have their own contributing factors. Ong and Coiera concluded that differences in the respective challenges presented by shift-to-shift and unit-to-unit handoffs should be reflected in the proposed solutions if they were to be effective.

At Bartlett Regional Hospital (Juneau, Alaska), the Medical Staff Quality Improvement Committee (MSQIC) reviews cases of adverse events, as identified by reports submitted by a nurse or physician when a perceived error occurs, that involve an unanticipated harm to the patient. In 2010 and 2011, the MSQIC reviewed 17 cases, 4 (23.5%) of the cases involving a communication error, including miscommunication regarding the patient’s unstable condition, resulting in failure of the admitting attending physician to prioritize the management of the patient and subsequent further deterioration in his or her condition. Such errors led the committee to focus on improving handoff communications between the ED and the four local private physician groups that admit and deliver care to patients of the hospital.

The hospital conducted a small rapid-cycle, Plan-Do-Study-Act project on use of the Situation/Background/Assessment/Recommendation (SBAR) method of communication, but the intervention was not successful. In October 2011 Bartlett Regional Hospital joined as a pilot site for testing the Joint Commission Center for Transforming Healthcare’s (the Center’s) Targeted Solutions Tool® (TST®) for handoff communications.

The Center was created in 2008 to apply the methodologies and tools of Lean, Six Sigma, and change management—known collectively as Robust Process Improvement® (RPI®)—to address the most difficult safety and quality problems facing health care. The TST for handoff communications was developed in 2012 on the basis of the Center’s work with 10 collaborating hospitals and health systems that fully implemented their solutions reduced their defective handoffs by 56.1%—from 41.0% to 18.0% (p = 0.007; paired t-test). Following the conclusion of the work, in which 10 collaborating hospitals and health systems participated, the Center pilot tested the project methods with a group of other health care organizations, including Bartlett Regional Hospital, which had much less RPI expertise to learn how to translate the lessons learned in the original project. The results of that work are embedded in set of tools and software called the TST, an innovative online application that guides users through every step of the improvement project without the need for any specialized training. Importantly, in addition to providing specific, effective improvement interventions, the TST guides users through supportive change management processes that are essential to achieving and sustaining higher levels of performance.

Other handoff communication studies that have used some of these RPI tools focused specifically on documentation completeness or on handoff communication turnaround times for clinical metrics. For example, Mistry et al. used the Six Sigma methodology to improve its turnaround times for clinical metrics. Some of the contributing factors identified in the Center’s handoff communication project were also identified by Mistry et al., including lack of standardization of the method/content and the occurrence of interruptions/distractions at the time of the handoff.

In this article, we describe how use of the TST was associated with improvement of handoff communications from the ED to the four private physician groups serving Juneau, Alaska, that admit and deliver care to patients of the hospital.

**Methods**

**Setting**

Bartlett Regional Hospital is a 73-bed, Level 4 trauma center hospital, with approximately 2,150 admissions per year. The hospital includes 29 medical/surgical and 6 critical care beds. Juneau, Alaska, has a population of 32,000, with summer tourist season bringing an additional 800,000 visitors annually. Accessible only by plane or boat, Juneau is isolated. In addition to the Juneau population, Bartlett Regional Hospital provides care to many of the small villages in southeast Alaska. Private physicians (20) and Indian Health Service primary care physicians (10; who care for the 6,000 Alaska Natives in Juneau), in association with the Southeast Alaska Regional Health Consortium, admit and deliver care to patients at the hospital. The ED is staffed by a private group of physicians who are either emergency medicine or primary care specialists.
ETHICS

Institutional Review Board approval was not requested because protected health information was not collected for the TST’s measurement tool.

ELECTRONIC HEALTH RECORD (EHR) vs. PAPER

The hospital has multiple EHR systems for use by various disciplines and departments. The inpatient units use MEDITECH version 5.61 (MEDITECH, Westwood, Massachusetts), and the T-System (T-Systems, Downers Grove, Illinois) is used for patients seen in the ED. The admitting primary care physicians do not document in the T-System and rely on printed information from the T-System for some of the patient’s information. After hours, computed tomography (CT) and magnetic resonance imaging (MRI) scans are read remotely, and reports are only available on paper, as are electrocardiograms (EKGs).

EMERGENCY DEPARTMENT EVALUATION AND ADMISSION BY PRIMARY CARE PHYSICIAN

When patients present to the ED, they are evaluated by the ED physician. If a patient requires admission, a primary care physician is called, and the handoff occurs via telephone. Depending on the circumstances, the admitting primary care physician either sees the patient in the ED or, before conducting a physical evaluation of the patient, calls in orders to the floor nurse who is taking care of the patient. If the admitting physician sees and evaluates the patient in the ED, he or she receives a clipboard of information—in a second handoff between providers. If the admitting physician cannot immediately see the patient, such as when he or she is attending to other patients or the admission occurs after hours, as often happens, the attending physician may choose to call in admission orders.

USING THE TST TO IMPROVE HANDBOFF COMMUNICATIONS

The TST outlines the initial steps and provides tools for assistance, including creating a charter with the scope, definitions, and identified team members. The project scope was defined as “the handoff process from the ED physician to the admitting physician for adult patients admitted to the medical/surgical and critical care units.” Pediatric, surgical, obstetric, orthopedic, and psychiatric patients were not included as part of the scope because of either a low number of admissions, differences in the handoff communication information needed, or differences in the handoff communication processes. The initiative, led by two of the authors [M.F.B., S.H.], began in October 2011 and finished in August 2012. A team was formed that consist-

ed of three physicians—one sender (ED physician) and two receivers (admitting primary care physicians)—and a specialist quality improvement nurse. For the purposes of this project, a handoff opportunity was defined as follows: “A communication of the transfer and acceptance of patient care responsibilities between a sender (ED physician), who is the physician responsible for sending or transmitting patient data and transferring care of the patient to the receiver (admitting physician), who is the physician who receives the patient data and accepts care of the patient.”

The team used the receiver (Figure 1, above; and available in color in online article) and sender measurement tools (Figure 2, page 110; and available in color in online article) created by the Center and housed in the TST. A defective handoff was one “that did not meet the sender’s or receiver’s needs to continue caring for the patient.” If the handoff was indicated as defective,
then the sender or receiver would mark the contributing factors that led to the defective handoff. The measurement tools for the identification of the contributing factors in the TST are customized on the basis of what the admitting physicians (receivers) considered to be critical information (see Figure 1, section G, for a list of the critical information)—that is, needed by the receiver at the time of the handoff and critical to continued care for the patient. (The admitting physicians identified critical information during a team meeting before data collection.)

**DATA COLLECTION TRAINING**

All 10 ED physicians, as senders, and 15 admitting physicians from the four private physician groups, as receivers, were trained and tested on the data collection measurement tools before the data collection phase. Training materials for the use of the measurement tools, including handoff-communication scenarios, were provided as part of the training within the TST.

Senders and receivers were trained separately because they served as observers for one another. Training was conducted through staff meetings and one-on-one sessions. To ensure accurate and reliable measurements, a test, also provided in the TST, was administered to the senders and receivers posttraining. The senders and receivers had to score at least a 90.0% on either the sender or receiver test to qualify as a data collector. Senders or receivers not achieving a passing score were retrained and retested before collecting data. We trained a sufficient number of senders and receivers to ensure a representative sample, including all shifts and all days of operation. The expectation was that the senders and receivers would fill out the data collection form after every handoff.

**DATA COLLECTION AND DATA ANALYSIS**

Physicians were able to enter data electronically (using desktop computers throughout the hospital, tablets, or laptops) or to submit written data collection forms available in the ED. The data were submitted anonymously by the senders and receivers for honest feedback without repercussions. Baseline data, collected from November 4, 2011, through January 12, 2012, were collected through random sampling by senders and receivers on different days and shifts to be representative of the handoff process. Because the sample size for senders was small (range, up to 2 per shift per day in the baseline phase) relative to that of the receivers (range, up to 12 per shift per day in the baseline phase), the results were pooled for senders and receivers. Contributing factors that led to an ineffective handoff were identified on the basis of the baseline data, and solutions that were targeted to the contributing factors were implemented. Data collection in the “improve” phase, which was also random, occurred from April 1, 2012, through July 29, 2012, to validate that improvements had been made; baseline and improve handoff-communication defective rates are shown in Figure 3 (page 111; and available in color in online article). Data on adverse events related to handoff communications were also collected.

The team met monthly to review data and analyze progress toward improving handoff communications. The team provided progress reports to the rest of the physicians via monthly staff meetings, medical staff quality review committee meetings, and e-mail reminders. Analysis was performed in real time within the TST (see Figure 3 for handoff communications defective rates and Figure 4 [page 112; and available in color in online article] for contributing factors). In addition, a 2-proportion t-test was performed to statistically validate the relative improvement made from the baseline to improve phases.
identifying the contributing factors and targeting solutions

The TST was used to identify the contributing factors to defective handoff communications and to implement solutions that are targeted to the most common contributing factors. Twelve different contributing factors for defective handoff communications were identified. Inaccurate/incomplete information, method ineffective, no standardized procedures, and poor sender knowledge accounted for 69.8% of the contributing factors that were identified (Figure 4). After we reviewed the baseline data, the TST directed the team to solutions that are targeted to the specific contributing factors. The solutions targeted to the contributing factors that were identified were as follows:

- A standardized handoff communication process, in which the ED physician (sender) states how urgently the patient needs to be seen by the admitting physician (receiver), including the admitting physician notifying the ED physician of his or her estimated time of arrival in the ED. The notification of the estimated time of the admitting physician arrival also helped the ED staff get the medical records ready, as they were time sensitive.

- The admitting physician (receiver) letting the ED staff know when he or she would arrive, and the ED staff printing the most up-to-date patient information for the admitting physician’s review. As stated, the ED physician (sender) used the T-System as their EHR, while the admitting physicians (receivers) used MEDI-TECH. Therefore, data were not always available to the admitting physician at the time of admission. If the ED staff printed the T-System information early, critical ongoing documentation was missed. Staff was hesitant to print the T-System record until the admitting physician came to the ED or until the patient left the ED if orders were phoned in.

- Attaching required documents to the patient’s chart. ED staff is required to attach specific documents to the patient’s chart. At times, some pieces of data, such as MRI, CT, and EKG reports, were located in the ED physician documentation area rather than on the patient’s chart (clipboard). The ED staff was educated to attach these documents to the patient’s chart, and the admitting physicians were instructed to ensure that there were not any additional items needed to complete the patient’s chart.

- A standardized communication by the ED physicians. Different communication styles and information needs existed among admitting physicians (receivers). Whereas some of those physicians wanted the whole story on the phone, others wanted to hear a brief scenario and then come to the ED to get a direct face-to-face handoff. The ED physicians (senders) now ask up front whether the admitting physicians (receivers) want a very brief snapshot of what is going on with the patient or a complete detailed handoff.

- A clipboard with needed patient information ready for the admitting physician’s review. The clipboard being prep by nursing or clerk staff seemed to be a key solution for improving the defective handoff communications rate. The ED nurse manager was involved to help facilitate this change. This was important in ensuring that needed information was available on the clipboard in time for the admitting physician’s review.

Results

Handoff Opportunities and Communications Defective Rate

A total of 211 random handoff opportunities were identified. Baseline results indicated a 29.9% handoff communications defective rate (32 defective handoffs/107 handoff opportunities, 95% confidence interval [CI] = 21.4%–39.5%), which decreased to 12.5% (13 defective handoffs/104 handoff opportunities, 95% CI = 6.8%–20.4%) in the improve phase (Figure 3)—representing a 58.2% relative reduction (p = 0.002; 2-proportions test).

Communication Errors

The percentage of adverse events due to communication errors at the end of 2013 was reviewed to determine the im-
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Impact of the initiative, although the total volume of reviewed cases was small (typically, 7 to 11 cases annually). In 2010, 42.9% of the 7 reviewed cases showed adverse outcomes due to communication errors. Subsequent annual percentages were 10.0% (N = 10) in 2011 (start of the project), 9.1% (N = 11) in 2012 (start of the solutions being implemented, April 1, 2012), 0% (N = 11) in 2013, and 0% (N = 9) in 2014. In a three-item survey sent to all 30 physicians after the conclusion of the project, 14 (48.3%) of the 29 respondents believed that there was a communication problem before the start of the project; of those 14 respondents, 12 (85.7%) agreed that there was improvement in communications shortly after the project’s completion, and 10 (71.4%) agreed that at least some improvement had been sustained.

Discussion
We describe here the use of the TST to improve handoff communications from the ED to the four local private physician groups that admit and deliver care to patients of Bartlett Regional Hospital. Providing change management support and implementing solutions targeted to the contributing factors was associated with an overall 58.2% relative reduction in the defective handoff communications rate from the baseline (29.9%) to improve (12.5%) phases. This level of improvement in the overall defective handoff communications rate was similar to the 56.1% relative reduction experienced overall by the organizations in the Center’s original Hand-off Communications project. Moreover, the reduction in the defective handoff communications rate was accompanied by a reduction in the number of adverse events related to handoff communications that occurred, with no adverse event reported since the implementation of the targeted solutions.

We identified many of the same key challenges for ED handoffs as had Ong and Coiera, such as lack of standardization of the process and content of the handoff and misalignment of the handoff between different physician groups, but also discovered eight other contributing factors to ineffective handoff communications, such as ineffective methods and the senders’ lack of knowledge of the patients—for a total of 12 contributing factors. As had been shown with respect to hand hygiene compliance, for example, there are many different contributing factors to defective handoff communications, and the set of contributing factors is different from one organization to the next. The TST’s unique approach to improvement, as opposed to the more typical, “one-size-fits-all” best-practice method, enabled us to provided validated solutions targeted to the specific contributing factors identified. For example, the identification of inaccurate/incomplete information as the top contributing factor to ineffective handoff communications was addressed, as stated earlier (see page 111), by having the admitting physicians (receivers) let the ED staff know when they would arrive and have the ED staff print the most up-to-date patient information for the admitting physician’s review. This solution not only addressed inaccurate and incomplete information but also alerted the admitting physicians, who used MEDITECH EHRs, to the ED physicians’ use of T-System EHRs. Now aware of what was available on the T-System, the admitting physicians could specify at the time of the handoff communication the information that they still needed. Finally, given different communication styles among the admitting phy-
The supportive change management processes was critical, we believe, to the success of the handoff communications project in facilitating acceptance of the solutions for improvement and then, more importantly, in sustaining those improvements over time. The TST provides tools to address change management issues that are often seen in performance improvement initiatives. Tools such as a stakeholder analysis and project charter were used for leadership support and staff engagement, and concepts such as communication of vision, staff involvement, creating staff ownership, leadership support and commitment, and staff support and commitment were used in the improve phase of the project for buy-in and acceptance of the solutions being implemented. We are not aware of any other handoff communications initiative that has used such a systematic approach. Unlike previous work, which has generally focused on the patient information, particularly the timing of receiving patient information and results, this initiative addressed the effectiveness of the entire handoff communication process for the continuation of the patient’s care, also entailing the method, the senders, the receivers, and the environment.

Limitations

This study had several limitations. Because the evaluation design provided for the comparison of the baseline and improve phases, we cannot be certain which implemented solutions were responsible for the reductions in the defective handoff communications rate. Because the handoff communications were collected as random samples, we cannot be certain that all handoff communication opportunities were captured or even of the number of observations captured by each data collector (sender or receiver) because of anonymity. Also, data could have been collected by both the sender and receiver on the same patient, which would tend to induce a correlation in the data, but this scenario would be expected to be rare and the impact negligible. Finally, although a reduction was seen in the number of adverse events related to handoff communications, we cannot be certain that the reductions in the defective handoff communications rate led to the reductions of adverse events related to handoff communications. The sample size for adverse events is low, which is a limitation to the statistical validation of improvement for this outcome.

Conclusion

Patient handoff communications are a key process for ensuring safe and effective care. Communications between the ED and admitting physicians at Bartlett Regional Hospital were improved in association with use of an online application, the TST, which provides targeted solutions to the specific identified contributing factors. Since the project ended in fall 2012, no adverse events related to handoff communications have been reported. Next steps for the handoff communications initiative is to spread this systematic approach used in the TST to other areas, such as the handoff communication process between the hospital and physicians’ offices.

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See the online version of this article for Figure 1. Hand-off Communication Tool—Receiver (color version)
Figure 2. Hand-off Communication Tool—Sender (color version)
Figure 3. Bar Chart of Defective Handoff Communications Rate, Baseline and Improve Phases (color version)
Figure 4. Contributing Factors to Defective Handoff Communications (color version)
References


Figure 1. Hand-off Communication Tool—Receiver

The Hand-off Communication Tool—Receiver, as provided in the Targeted Solutions Tool® (TST®), includes the critical elements (G). If the receiver indicated the handoff as defective, then he or she would mark the contributing factors that led to the defective handoff.
Figure 2. Hand-off Communication Tool—Sender

In the Hand-off Communication Tool—Sender, as provided in the Targeted Solutions Tool® (TST®), if the sender indicated the handoff as defective, then he or she would mark the contributing factors that led to the defective handoff.
The bar chart shows the project’s aggregate handoff communications defective rate for the baseline (November 4, 2011–January 12, 2012) and “improve” (April 1, 2012–July 29, 2012) phases, for a 58.2% reduction (29.9% to 12.5%; \( p = 0.002 \); 2-proportions test).
Figure 4. Contributing Factors to Defective Handoff Communications

The Pareto chart, which was produced by the Targeted Solutions Tool® (TST®), shows the contributing factors from highest to lowest frequency. The chart will tell a health care organization exactly which contributing factors it needs to work on to make the biggest gains in handoff communications.

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