

Use of an Electronic Alert Tool to Prevent Readmissions Following Coronary Artery Bypass Graft Surgery

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ABSTRACT

Objective: Cardiothoracic (CT) surgeons at our medical center were not receiving timely notification when their coronary artery bypass graft (CABG) surgery patients were admitted to the medical center or to other hospitals. The CT surgical team worked with a health alliance in southeastern North Carolina to implement health information exchange (HIE) real-time electronic notifications for their CABG patients who presented to the hospital's emergency department (ED) or any ED affiliated with the medical center. The alert tool notifies team members about patient encounters, driving timely clinical engagement.

Methods: The CT team provided the HIE team with the names of CABG surgery patients, which were loaded into the alert tool. When a patient on the list presented to the hospital ED or its affiliates, the alert tool sent a real-time electronic notification to the Cardiac Surgical Services nurse coordinator. This intervention prompted the assessment and disposition of CABG patients, while in the ED, by the CT surgical team.

Results: Over a 16-month period (September 2017-December 2018), the names of 614 post-CABG patients were input into the HIE for tracking. Of these patients, 47 were treated and discharged from the ED; 31 were admitted for observation; 44 were readmitted for inpatient care; and 492 did not have a qualifying event requiring a notification alert. Following implementation of this practice change, the 30-day readmission rate for patients who underwent CABG at our institution decreased from 10% to 7.2%.

Conclusion: Utilizing a real-time alert tool resulted in immediate notification of the CT team when 1 of their patients presented to the ED. This afforded the CT surgical team an opportunity to intervene in the care of their patients, which in turn led to improved quality of care, physician communication and collaboration, and patient outcomes, such as preventable 30-day readmissions.

Keywords: electronic health record; real-time electronic notification; CABG; process improvement.

Unplanned 30-day hospital readmissions of patients who have undergone coronary artery bypass graft (CABG) surgery contribute to higher overall health care costs. CABG is 1 of the conditions/procedures that the Centers for Medicare and Medicaid Services (CMS) monitors for excess readmissions.¹ Readmission rates for CABG-related conditions at 30 days post-surgery are reported to be between 16% and 20% for US hospitals.² Readmissions are not only financially costly, but also have been associated with worse patient outcomes and decreased patient satisfaction.³ Common diagnoses for post-CABG admission include atrial fibrillation, pleural effusion, and wound infection.

The facility where this project was implemented had a 10% post-CABG admission rate for patients across all pay-

ers. While this rate is below the national average of 13.2%, the cardiothoracic (CT) surgical team was not being notified in a timely manner when their post-CABG patients were readmitted. The Lean team used the A3 problem-solving process to develop strategies that would reduce these readmissions and improve the care of their patients.

We explored the use of electronic alerts in managing post-CABG patients by conducting a literature search using the terms *electronic alerts in patient care*, *patient*

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engagement in the emergency department, electronic alerts in CABG, real-time notifications to prevent readmission, and CABG readmission. Databases searched were PubMed, Google Scholar, Cumulative Index of Nursing and Allied Health Literature, ProQuest, and ScienceDirect. This search resulted in studies focused on the use of electronic health record (EHR) alerts as a clinical decision-support tool; for example, patient demographic and assessment data are entered into the EHR, and the clinician is prompted with “performance” recommendations (eg, consider electrocardiogram and aspirin).⁴ In a paper by Engelman and Benjamin,⁵ the authors discuss the importance of the engaged physician and note that, in their emergency department (ED), an electronic notification is sent when a postoperative patient presents; however, the notification goes to the inpatient service for timely review and disposition. There was no literature that discussed the use of an electronic alert tool as a real-time patient engagement strategy that resulted in a practice change specific to the CT surgical team.

Our process improvement project focused on alerting the CT surgical team when a post-CABG patient presented to the ED, allowing them to evaluate the patient in real time and determine whether the chief complaint was related to the CABG and whether further evaluation by the CT surgeon was required. Specifically, we wanted to determine whether a real-time electronic alert that notified the CT surgical team about post-op CABG patients presenting to the ED would result in timely patient engagement, avoidance of readmissions, and an enhanced patient experience. During this project, alerts were sent to the CT surgical team notifying them of a post-CABG patient presenting to the ED or being directly admitted from home on physician orders, a provider’s office, or inpatient rehabilitation; however, the focus of this article is specifically on the notification regarding post-CABG patients presenting to the ED.

Prior to implementing the electronic notification project, the team developed and implemented several internal and external readmission reduction and prevention strategies for CABG patients. An in-house strategy involved a process whereby patients would receive their discharge medications prior to being discharged from the hospital post-CABG, thereby avoiding potential delays in the patient obtaining medications. When examining post-CABG patient readmissions, the primary conditions that led to readmission were

fluid overload, pleural effusion, and atrial fibrillation. As such, a second in-house strategy was developed for post-CABG patients presenting to the ED with atrial fibrillation. The newly established protocol allowed patients to be monitored and treated in the cardiac observation unit. In addition, external strategies, including an outpatient furosemide protocol for home health nurses and an outpatient thoracentesis program and order set, were established (eg, for patients with congestive heart failure, shortness of breath).

Methods

Setting

The regional medical center where this project was implemented is the ninth largest hospital in North Carolina and the largest county-owned public hospital in the state. It is a tertiary care center and teaching hospital with 3 hospital campuses and 855 licensed beds. The medical center was included in the 100 Safecare Hospitals list by the Safecare Group; received a grade “A” Hospital Safety Score from the Leapfrog Group; and is 1 of America’s Top 100 Hospitals for Patient Experience.

Real-Time Notification Project

A regional hospital alliance in southeastern North Carolina established a health information exchange (HIE) with its member hospitals and office-based physicians to enable electronic exchange of patient information to improve quality, safety, and efficiency in health care delivery. Our medical center is part of this alliance. The HIE is a digital platform that facilitates the sharing of information between disparate connected EHR systems, and offers a portal for practices and hospitals to access patient information across North Carolina, South Carolina (via SC HIE), and nationwide (select dialysis centers). More specifically, approved providers and team members are able to access, in real time, patient-care encounter documents from other care settings (eg, acute, post-acute, ambulatory) via the HIE. Additionally, approved care entities can query-retrieve web portal information to support patient outcome improvement strategies. A partnership discussion highlighted the opportunity to utilize the HIE’s capabilities, such as real-time notification, to facilitate workflow (eg, when a patient presents to the ED, the HIE can provide access to health information at the point of care). In this capacity, the alert

Electronic Alert Tool

tool notifies care team members about patient encounters to drive timely clinical engagement for care transitions.

In January 2017, we began discussions on using the HIE to facilitate real-time electronic tracking in the Cardiac Surgical Services department at our medical center. Persons involved in these discussions included the cardiovascular (CV) team (comprised of case managers, department managers and coordinators, program coordinators, administrators, and support services [eg, pre-admission testing and home health staff]) and CT surgeons. At that time, CABG readmissions were manually tracked, and the real-time notification tool was being used in other departments (eg, in case management for tracking readmissions). The entire team was part of the initial decision meeting to pursue this possibility. The CV team reached consensus in June 2017 and proposed extending the use of the alert tool to the post-CABG population presenting to the ED (or any ED affiliated with the medical center) or admitted directly to the medical center.

The HIE staff met with the Cardiac Surgical Services team to tailor and develop the logistics of the project, such as who would be notified and how. The goals of the project were to support appropriate care intervention, reduce preventable hospital readmissions, and improve quality of care through enhanced provider communication and engagement. To achieve these goals, on the day of discharge the Cardiac Surgical Services coordinator provided the HIE team with the names of patients who had undergone CABG surgery. This patient list was loaded into the alert tool and continually updated. At 31 days, patient names were removed from the list. When a patient on the list presented to the hospital ED, the alert tool sent 2 real-time electronic notifications, an email and a text message, to the Cardiac Surgical Services coordinator, noting that a patient event occurred. Personal information was not included in the alert in order to protect patient information and comply with Health Insurance Portability and Accountability Act regulations.

The alert prompted the Cardiac Surgical Services coordinator to securely access patient information to identify and, if necessary, visit the patient. Then, based on the information gathered by the Cardiac Surgical Services coordinator, a Situation-Background-Assessment-Recommendation report was relayed to the CT surgeon, who then determined whether intervention by the CT surgical team was warranted.

This process, on average, took approximately 30 minutes to complete. This was a key change in processes, one that allowed post-CABG patients to be seen by the CT surgical team while in the ED. If the issue was related to the CABG surgery, the CT surgeons could then determine an appropriate course of action, including admission or implementation of another protocol, such as the home furosemide protocol. For patients directly admitted, the surgeon contacted the admitting provider to discuss the level of care required (ie, observation or inpatient admission and treatment).

Biweekly CV team meetings were conducted during the implementation of the real-time notification alert tool. At each meeting, updates were provided on notifications received, patients who were missed by the notification process, and how well the real-time alerts were working to enhance care and appropriate disposition.

Measurements

Clinical performance data included total notifications, total number of ED visits, ED disposition (inpatient admission, observation, discharge), total number of direct admissions, direct admissions to observation, direct inpatient admissions, and patients missed by the notification process (eg, due to data entry errors, omissions of information [suffix of junior or senior], as well as programming bugs). Finally, the number of observation admissions converted to inpatient admissions was collected and further analyzed to inform needed process changes.

The Cardiac Surgical Services coordinator collected, entered, and maintained data using Excel. Data were obtained from the EHR, recorded in Excel, and analyzed using basic descriptive statistics in an ongoing fashion. Particular attention was focused on problems with the notification process (eg, patients being missed due to errors in data entry) and summarizing information to keep the Cardiac Surgical Services team updated on the progress of the process improvement. This project did not require staff protections or considerations, and because this was not a research study Institutional Review Board approval was not required.

Results

This practice change was implemented in September 2017 and led to improvements in care quality, as evidenced

by improved physician communication and collaboration. In the 16-month period from implementation through December 2018, the names of 614 post-CABG patients were input into the HIE for tracking. Of these patients, 47 were treated and discharged from the ED; 31 were admitted for observation; and 44 were readmitted for inpatient care. The remaining 492 patients did not have a qualifying event requiring a notification alert. Clinical performance data from this period included 70 ED visits, 21 direct admissions, 19 direct admissions to observation, 5 patients missed by the notification process, and 4 observation admissions converted to inpatient admissions. A reduction in the CABG readmission rate from 10% in September 2017 to 7.2% in December 2018 was also noted.

Discussion

The aim of this process improvement project was to determine whether a real-time electronic alert that notified the CT surgical team about post-op CABG patients presenting to the ED would result in timely patient engagement, avoidance of readmissions, and an enhanced patient experience. This practice change has been successful, following 16 months of implementation and process refinement. Integrating a real-time electronic alert with a supporting action plan and care protocols resulted in timely patient engagement and avoidance of readmission of post-CABG patients.

Early notification of possible post-CABG readmissions became a standard-of-care process within the Cardiac Surgical Services department, with expansion to all CT post-op patients. Leveraging HIE technology to support quality improvement processes was also viewed by other departments as relevant and beneficial. For example, the hospital stroke and orthopedic-spine teams established their own processes for receiving real-time alerts.

There were several lessons learned during this project. First, gaining 100% physician buy-in to collaborative communication proved to be critical to the project's success. The CV team was surprised by the length of time (approximately 8-10 months) it took for the practice change to be adopted by the physicians. In part, some of this delay in adoption resulted from medical staff turnover, primarily in the medical resident training rotations. Collaborative communication was key. The CT surgeons spoke with ED leadership and hospitalist services to explain the readmission

reduction project and the use of an electronic alert tool. The CT surgeons also communicated to the ED physicians, hospitalists, and cardiologists that the Cardiac Surgical Services coordinator would be involved in the process and discussions regarding patient's care. Additionally, the CT surgeons authored the furosemide protocol and then committed to its use in the home health setting, further highlighting the role of collaborative communication in avoiding readmissions.

Another key step in this quality improvement project was determining who should receive the alert notifications. At the onset of the project, all notifications were sent to 1 person, the Cardiac Surgical Services coordinator. While this seemed logical in the initial stage of the project, it was unsustainable, as the receipt of the alert and the subsequent notification of the CT surgeon depended on 1 person and their availability. Approximately 10 months into the project, the notification process was further refined, with the cardiovascular intensive care unit charge nurse becoming the point of contact for the alerts. The Cardiac Surgical Services coordinator, in collaboration with nursing leaders and CT surgeons, completed a Lean Standard Work template outlining the major steps and the associated responsibilities (for the cardiovascular intensive care unit charge nurse, CT surgeon and on-call surgeon, Cardiac Surgical Services coordinator) in the process of receiving notifications, collecting patient assessment data, and reporting notifications to the CT surgeons.

Establishing adequate support mechanisms during a practice change is also important. For instance, we had to dedicate personnel time for data collection and analysis and involve additional nursing or other qualified personnel in the new process to avoid depending on a single person for the project's success. Additional considerations were establishing criteria for surgeon notification and defining an appropriate time frame for notification (eg, urgent versus next-day notifications). We accomplished these activities approximately 10 months into the project, after it became apparent at CV team meeting discussions that further clarification of criteria and timelines was needed.

Some aspects of the project unfolded as planned, while others presented opportunities for improvement. For example, the alert notification process worked as envisioned; however, as previously mentioned, the process needed to

be more inclusive to ensure there is always a charge nurse on duty to receive the alert notification, rather than just the Cardiac Surgical Services coordinator, who may not always be at the hospital. The outpatient thoracentesis program was well planned and effectively implemented. This program provided an avenue for patients who had symptoms of pleural effusion to be treated in an outpatient setting, rather than requiring an inpatient stay. Opportunities for improvement included addressing the inconsistent use of the home health furosemide protocol (developed in 2016), and the need for continued interprofessional and interdepartmental communication and coordination. For example, we had to inform the ED physicians and staff who rotate or are new to the ED about established processes and protocols in place for managing post-CABG patients who present to the ED.

The primary limitation of this project was the inability to measure the enhanced patient experience, which was 1 of the stated project goals. This goal became secondary because of more pressing issues, specifically, interorganizational collaboration (eg, hospital EHR, HIE, and CT surgical team) and tailoring the functionality of the electronic alert tool to the project. Developing and implementing measures of enhanced patient experience were not feasible during this implementation. Additionally, because this was not a research study, it was not possible to determine cause and effect or to control for confounders, such as a sicker, older cohort with more comorbid conditions, during the comparison period. Finally, although this process improvement project was conducted at a regional medical center that is the only facility performing CABG within the region, patients may have presented to another facility for an event that led to a readmission. Because readmissions to other facilities could not be captured, it is possible that the actual readmission rate was higher than the rate reported here.

Conclusions and Implications

Utilizing a real-time alert from the HIE to the CT surgical team resulted in CT surgeons being immediately made aware when their patients presented to the ED, allowing the CT surgical team the opportunity to intervene, as appropriate, in the care of their patients. Furthermore, this real-time notification and intervention resulted in timely patient engage-

ment and, in some cases, avoidance of readmissions. Currently, patients are monitored for readmission within 30 days of discharge. In the future, the time will expand to 91 days, in preparation for participation in the CMS bundle payment program for CABG surgery.

This practice change can be used in organizations that do not have or participate in a HIE. In fact, these real-time alert applications may be available through an EHR already in use within the organization. The use of the alert requires collaborative communication and having supporting protocols in place to guide decision-making and care of post-CABG patients presenting to the ED.

There appears to be a gap in the literature discussing the use of an electronic alert tool as a real-time patient engagement strategy for post-CABG patients presenting to the ED. As such, this project contributes important results and lessons learned for other hospital service lines/departments that might consider implementing a similar process. Next steps include designing and conducting methodologically rigorous research studies based on this process improvement project to examine mortality rates as an outcome, and designing a more specific measure of patient experience, as the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey only provides hospital-level data.

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