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Implementation of a Pilot Electronic Stroke Outcome Reporting System for Emergency Care Providers

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Abstract

Introduction—Emergency department (ED) providers and clinicians find that feedback on acute stroke patients is rewarding, valuable to professional development, and helpful for practice improvement. However, feedback is rarely provided, particularly for patients with stroke. Here we describe the implementation of an electronic stroke outcome reporting tool for providing feedback to ED providers.

Methods—We sought to evaluate the implementation of an electronic stroke outcome reporting tool at 3 Nashville hospitals. ED staff and providers voluntarily enrolled to receive de-identified reports of clinical (e.g., survival) and operational (e.g., timeliness) outcomes of patients with acute ischemic stroke and were offered free continuing education (CE) credits for following up on patients. We evaluated the implementation of this system through a descriptive evaluation of the feasibility, use of the system and CE, and perceived usefulness of the reports.

Results—We enrolled 232 ED providers, including 107 (46%) nurses and 57 (25%) attending physicians and transmitted 55 stroke outcome reports. Reports took 30–60 minutes to compile and

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were viewed by a mean of 2.6 (SD 1.5) registered providers; 97.1% found the reports useful and 36.2% reported likelihood to change practice. Continuing education credits were initiated or claimed by 22 providers.

Conclusions—An electronic stroke outcome reporting tool was used and liked by ED staff and providers but the time to compile the reports is the major challenge to scalability. Future research should address the effectiveness of this reporting tool as a source of provider education and its impact on clinical and operational outcomes.

INTRODUCTION

Audit and feedback is a recognized strategy to change provider behavior in the ED,¹ particularly when paired with an explicit target (e.g., education of best practices).² Feedback of patient outcomes to ED providers is important for professional satisfaction, process improvement, clinical education, and medical error prevention.^{3,4} However, existing patient outcome reporting systems are variably delivered, not user-centered, and rarely reach all of the involved staff and providers,^{1,4,5} especially when patients are transferred between facilities for emergency treatment.⁶ Feedback on patient-level clinical and operational outcomes to healthcare providers represents an opportunity for learning and behavior change. Yet, developing scalable feedback systems remains a major challenge.

Acute ischemic stroke is representative of the type of condition for which feedback on patient outcome reports is useful. Stroke is common and associated with substantial morbidity and mortality requiring timely and accurate diagnosis and treatment for optimal outcomes. Feedback in the setting of acute stroke patients has been found to be effective at reducing door-to-needle times for the administration of thrombolytics.⁷ Furthermore, systematic and timely feedback of door-to-needle times is now recognized as a core component of the *Target: Stroke quality improvement initiative* of the American Heart Association/American Stroke Association.^{8,9} Prior qualitative work with ED providers who care for acute ischemic stroke patients found that feedback on patient outcomes is similarly lacking, not timely, rarely included the entire staff who were involved in patient care, and was viewed as a barrier to process improvement.⁶ Thus, we sought to use stroke ED visits as a use-case for developing a patient outcome feedback system for ED staff and providers.

METHODS

We sought to conduct and evaluate a pilot implementation of an electronic stroke outcome reporting tool delivered to ED providers (staff, nurses, and physicians). We developed an electronic reporting tool to deliver feedback in the form of de-identified patient outcome reports to ED providers involved in the treatment of acute ischemic stroke patients. Patient encounter details including clinical care and operational metrics were collected and generated using REDCap™ (Research Electronic Data Capture). REDCap™ is a secure, web-based application designed to support data capture.¹⁰

Institutional review board (IRB) approval as quality improvement was obtained through Vanderbilt University Medical Center (VUMC). Two weeks prior to go-live, we opened electronic registration to all ED staff and clinical providers. ED providers from VUMC and

two Nashville hospitals that transferred stroke patients to VUMC were contacted through emails from clinical leadership and posted flyers. Providers voluntarily signed up through a REDCap™ database and could select a mode of delivery either through email or SMS-based text message delivered via Twilio (San Francisco, CA). Eligible cases were identified if the patient presented to the VUMC ED and a stroke alert was activated. Staff from the transferring and receiving hospitals were identified through a review of the patient's electronic health record.

To enhance performance of follow-up, we offered paramedics, nurses, and physicians free continuing education (CE) credits for viewing patient outcome reports. No testing was required as the performance of follow-up was recognized as sufficient to meet education requirements. CE was accompanied by supporting information (e.g., stroke guidelines, institutional protocols, and relevant research). Patient outcome reports were compiled by study investigators (JE and WS) through manual chart review of eligible patients 72 hours after patient arrival to the VUMC ED in order to report the likely trajectory of the patient's care. Transferring records (when applicable), ED, and inpatient records were reviewed to complete the reports. De-identified reports were distributed electronically to enrolled staff and providers via preferred methods. Reports were compiled and included a brief history of presentation, operational outcomes (e.g., door-to-tPA), hospital course, staff involved, and relevant images. A sample patient outcome report can be seen in Figure. Protected health information was omitted to enhance access to outcome reports. We suspected providers would recall acute ischemic stroke patients with de-identified data if outcomes were reported in close proximity to the event (e.g., <72 hours).

We evaluated the following implementation outcomes: use, usefulness, feasibility, and likelihood to change. Use was tracked through embedded REDCap™ analytics which captured timestamps for when unique viewers accessed a report. In addition, we also measured the use of CE credits and was defined as either the initiation or completion of CE credits. Usefulness and likelihood to change were collected through a survey of staff and provider perceptions that allowed for open-ended responses. Feasibility was assessed through the amount of time to compile reports. As this was a pilot implementation, we planned to run this program for 30 days.

RESULTS

Among three EDs, 232 staff and clinical providers signed up to receive electronic reports and included: 107 (46%) nurses, 57 (25%) attending physicians, 26 (11%) resident physicians, 15 (7%) paramedics/technicians, 15 (7%) other providers (e.g. social work), 6 (3%) advanced practice providers (e.g. NP or PA), 5 (2%) nursing assistants, and 1 (<1%) attending neurologist. Staff and providers initiated or completed CE credits for 22 reports. Manually completed reports ranged from 30 to 60 minutes to compile. Among 55 outcome reports with at least one registered provider, there was a mean of 6.0 (SD 2.0) providers/case and 4.1 (SD 1.5) of these were registered. Reports were viewed by a mean of 2.6 (SD 1.5) registered providers (63.4%). Only one provider reported difficulty recalling the patient involved in the report. On a scale of 1-to-100, overall usefulness was a mean of 78.7 (SD 6.1) with nurses rating the reports as most useful (81.9, SD 15), followed by ED residents

(77.7, SD 14.7), then ED attendings (73.0, SD 16.8). Overall likelihood to change was a mean of 36.2 (SD 15.2) with ED residents rating the reports as most likely to change their practice (46.6, SD 32.5), followed by nurses (38.4, SD 28.9), then ED attendings (30, SD 21.7).

Representative quotes from open-ended comments included the following on usefulness, “*I love the idea of getting to see how things turned out for my patient*” (ED Nurse), and its usercenteredness, “*I really like the format of the feedback that you are sending. It’s concise, but has all of the relevant data that I want to see for these follow ups*” (ED Nurse). Finally, one ED physician requested expanded use of the reports, “*I would love to see this expanded to ALL pts that we transfer.*”

DISCUSSION

We completed a pilot implementation of a de-identified electronic stroke outcome reporting system for ED staff and providers. Novel features of this system include timely, de-identified, electronic feedback delivered to provider preferred locations for the entire ED team that cared for a stroke patient, including staff and providers at transferring EDs, with the eligibility to obtain free CE credits for performing follow-up. This pilot has four main takeaways. First, electronic reporting of patients with stroke was used and well-liked by staff and providers. Second, such a reporting system may represent a potential delivery system of targeted education of staff and providers. Third, CE credits represent a novel approach to incentivize patient follow-up but may have limited impact on use. Finally, challenges to scalability exist due to the amount of time required to compile reports.

During this pilot implementation, we found that omission of protected health information enhanced transmission of outcome reports by allowing for flexibility in the mode of transmission (e.g., text or email) that were used by nearly two-thirds of staff and providers and were liked. Distribution of patient outcome reports also represented an opportunity for educational outreach to ED staff providers, which may be particularly useful for dissemination of best practices in healthcare which are known to be prolonged.¹² Although our pilot system did not provide a recommended change nor was it targeted, more than one-third still reported a likelihood to change their practice. However, while CME is known to be effective at enhancing provider performance and patient outcomes,¹¹ we observed low levels of use of CE, despite reduced requirements to earn such credits.

Finally, a central challenge to the widespread use of such a feedback system is through the enhancement of the efficiency of report production. Reports took between 30 and 60 minutes to compile primarily due to the manual nature of chart review. Automated extraction of free text and structured data from our electronic health record represents a promising future direction to enhance the efficiency of report production.

Future areas of investigation include understanding how the reports are used and which sections are of most interest to users, effectiveness of the reports to change behavior, scalability, and how such a feedback system influences patient outcomes. In summary, this pilot implementation demonstrated that an electronic outcome reporting system for stroke

patients tailored to staff and provider preferences is frequently used and well liked but requires further efficiencies to enhance scalability.

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PATIENT CASE REPORT
Acute Ischemic Stroke

VANDERBILT UNIVERSITY
MEDICAL CENTER

PATIENT PRESENTATION

- **Initial NIHSS:** 3
- **Patient History:** 52 year old man with stroke 2018 tx w/ enoxaparin, presented to OSH after developing L facial droop, dysarthria, and homonymous hemianopsia. NIHSS progressed from 3 to 8. tPA contraindicated 2/2 lovenox. Underwent successful thrombectomy (TICI 3: full perfusion restored) of R MCA thrombus.
- **DX:** Successfully treated R MCA M1 occlusion with bilateral scattered infarcts

TIME METRICS

- **Last Known Normal:** 10:00
- **OSH Arrival:** 12:57
- **OSH CTA:** 13:13
- **Transfer Call:** 13:59
- **VUH Arrival:** 14:43
- **VUH Stroke Alert:** 14:49
- **OR Arrival:** 15:34
- **Procedure Start:** 15:48
- **Procedure End:** 16:10

Clot in the shape of arterial bifurcation

CASE CONCLUSION

- **VUH Door to OR:** 51 min
- **Current Status:** Discharge on HD 2. Able to walk unassisted and is back to baseline with exception of some residual dysarthria

PATIENT CARE TEAM

- **Neurologist:** Dr. XXX, Dr. YYYY
- **Neurointerventionalist:** Dr. AAAA
- **Vanderbilt ED Physician:** Dr. YYYY, Dr. ZZZZ
- **ED Nurse:** X.YYYY, M. ZZZZ

Contact Stroke Coordinator at 615 –XXX – YYYY for further follow-up, or visit
www.vanderbiltemergency.com

Vanderbilt's Cerebrovascular Team Consultation Service Line (615) XXX-YYYY

Figure.

Sample stroke report delivered to ED staff and providers.