2014 Gage Awards

Reference #	7488441
Status	Complete
Name of hospital or health system	Stony Brook University Hospital
Name of project	Utilizing the Electronic Medical Record to Assist in the Early Detection of Severe Sepsis
CEO name	L. Reuven Pasternak, MD
CEO approval	Check here to confirm that your CEO approves of this project being submitted for a 2014 Gage Award
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Within which of the two categories does your application best align?	Quality

1. Provide a brief description of the project. (This section should resemble an abstract for a poster presentation or an abstract for a peer reviewed journal. Include an objective, data sources, study design, findings, and conclusions.)	In January 2006 our hospital actively engaged in the Surviving Sepsis Campaign via the Institute for Healthcare Improvement's Learning Collaborative. We agreed to adopt the Surviving Sepsis Campaign's goal of a 25% reduction in mortality through the use early recognition and the timely implementation of a resuscitative bundle. Although our emergency department exceeded this goal, our inpatient units continued to struggle with early detection, ultimately resulting in delays in care. With this in mind, Stony Brook undertook an initiative in 2011 to develop an electronic screening alert based on a patient's vital signs and lab results within the Cerner electronic medical record (EMR). Select systemic inflammatory response criteria, or SIRS, charted in the patient record would serve to alert the bedside nurse, incorporate their own critical review, and alert the team, as needed, for immediate diagnostic and treatment protocols. These protocols focus on serum lactate collection, blood cultures collected prior to antibiotics, administration of antibiotics within 60 minutes of recognition, and 30 ml/kg of fluid bolus with vasopressor therapy, as needed. This pilot project began with our medicine inpatient units, incorporating roughly 60 beds for a three month test period, after which the roll-out would progress to new units. A multidisciplinary team worked closely to develop, implement, test, and redevelop an alert that was both sensitive and specific while avoiding the general alert fatigue often associated with e-alerts. Unit-based reports were created to track alert fires and alert compliance and accuracy, including a full review on any patient found to meet our severe sepsis/shock criteria. These results were reviewed with unit staff on a weekly basis and presented to higher level service meetings. A database that had been in use since our sepsis campaign initiation was altered to include this new influx of inpatient caseload and better capture our progress throughout this alert initiative. By mid-2013, with inclusion of our ICUs, nearly 320 of our 603 total beds are included in our sepsis alert initiative with pediatrics and our ED to follow by mid-2014. Whereas pre-implementation severe sepsis/shock recognitions on our medicine units numbered less than twenty in prior years, this number has since increased fourfold. This data is mirrored in our recent ICD-9 coding rates for sepsis, severe sepsis/shock, reported through the University Hospital Consortium (UHC), showing marked increase in cases and improvements in ICU LOS, mortality, and mortality index (O/E). Prior to this alert, tracking recognition relied heavily on our Rapid Response Team (RRT) screening the patient upon arrival. At this point, our capture rate flows forth from the bedside staff, with assessment, critical discussion, and treatment beginning at the very point of patient deterioration.
1A. Attachment, if applicable (Applicable examples include a peer reviewed journal article, other content published in the literature, or a presentation at a national meeting)	NAHQPresentation6.13.pdf (2173k)

2. Describe the methods use in this project. Include where, why, and how the project was accomplished.	With the prior work done for sepsis detection and treatment in our ED, the knowledge base, screening criteria, review tools, data collection, and treatment bundles all existed in practice, albeit on paper. Sepsis treatment protocols existed in our EMR, but with little prompt for use. Thus we began working with our IT/CI departments to develop an entirely novel electronic screening to mimic our paper process. The screen consists of 3 questions: 1) Is the patient's history suggestive of a NEW infection; 2) Are any two of the following signs and symptoms (SIRS) both present and new to the patient? 3) Are any organ dysfunction criteria that are not considered to be chronic conditions present? An algorithm was designed to pull the second question, signs of SIRS, directly from the medical record within a 4 hour time window. Any two abnormal SIRS criteria would trigger the alert to fire a task to the bedside nurse, asking their assessment regarding the patient's history and suspicion of infection. This is completed via a short form with mandatory fields to move forward. If there is no suspicion, the task is complete and will be automatically suppressed for a further 8 hours. If suspicion is present, the nurse is directed to contact the covering physician and record their name. An automated serum lactate order was built into the admission order sets to generate a collection task upon suspicion. Previous studies show this test to be highly indicative of organ dysfunction in a septic patient with abnormal values resulting >2.0 mmol/L. Finally, a free text box is offered on this task form for the nurse to explain any critical thinking for the justification of their answer. Initially, this project began with two of our medicine units, comprising a manageable 60 beds total. Weekly meetings with medical and nursing staff, IT/CI liaisons, and quality professionals allowed for small tests of change throughout the testing phase, including the removal of hyperglycemia from our alert criteria or extending the charted review to a 5 hour window to better account for scheduled vital signs. Inclusion of suggested sepsis treatment powerplans were built in to the alert when suspicion was affirmed. After the initial successes, the initiative was expanded to an additional 60 beds with detailed reporting for three months, and so on. Meanwhile, general monitoring for alert compliance and patient recognition and treatment continue on all previous units.

3. Describe the results of the project. What data was used to support improvement results?	Persistent and real-time feedback became the backbone of this project. Upon implementation, our IT department was able to develop reports to track the number of alert fires on a weekly basis. These fires, reviewed by both quality personnel and bedside staff, were compiled into alert compliance rates, including precise opportunities and “good catches” by our bedside nurses. Ultimately, our goal was a 95% compliance rate with accurately answering an alert, including the critical reasoning behind the answer. With an average monthly fire rate of 103 alerts per non-ICU unit, we were able to manage accurate and actionable reporting and achieve this compliance goal within the three month target window on each unit. Early project outcome results focused on our medicine units who took on the responsibility of being our pilot unit and became the first inpatient service to fully employ the alert, including nearly 180 inpatient beds. These results focused on our screening capability, historic versus current numbers of patients flagged, screened and confirmed to present with severe sepsis or septic shock. These cases were then studied for both bundle compliance and mortality outcomes. Whereas pre-implementation figures of 2009-2010 contributed just 15 cases per year, that number climbed to 22 in 2011 despite only pilot testing of the alert. This trend continued with additional medical units using the alert, 58 total cases were found in 2012. Compliance with the bundle elements remained the same throughout the roll-out and has been attributed to earlier sepsis treatment resulting from a more experienced Rapid Response Team. However, mortality showed a significant decrease, 28.80 for the time period of 2009-2011 down to 10.30 for 2012 (p=0.018). The trend continued through the early months of 2013. Our ICD-9 coding data was further used to determine a more house-wide picture of our sepsis, severe sepsis and shock cases (995.91, 995.92, 785.52, respectively). Coding confirmed decreases in ICU LOS, mortality and a statistically significant decrease in our mortality index (O/E), now at 1.01 (Q3 2012-Q2 2013), in accordance with the alert expansion. Caseload was also increasing as we accurately recognized, and accurately treat and document, these declining patients. Our cases number has increased nearly 28% within the recent year. Similar results were present when reviewing only severe sepsis and septic shock.
3A. Attachment, if applicable (Only graphically displayed data such as charts will be accepted. Data should include baseline and improvement data)	UHCTrendingSepsisCodes7.13.pdf (193k)

4. Describe what happened as a result of the project. Was the improvement related to the intervention? Can the project be duplicated by other organizations?	While the sepsis initiative began at Stony Brook in 2006, many improvements in recognition and of care were in place when the alert went live. However, outside of our ED or ICU, much of our inpatient units continued to rely on a Rapid Response Team to recognize and initiate treatment, ultimately beginning this treatment from an already delayed recognition. This alert has helped to alleviate that delay, bringing the patients immediate welfare forward to our bedside staff while ensuring adequate consideration for subtle, systemic changes in their vital signs. It is difficult to relate direct causation from this project as it was, and continues to be, an expansion throughout the hospital over time. The correlation of increased recognition, bedside discussion, treatment, and ultimately the understanding of how to recognize and treat a patient becoming septic as a consequence of the alert process is undoubtedly present. While much of the project data comes from intensive, real-time review, the fact that similar trends are realized in our ICD-9 coding lends validity to our findings. Furthermore, the alert compliance itself remains >90% for all past units, ensuring the engrained reliability of its purpose and function. Stony Brook has employed the Cerner EMR and built our alert platform per those specifications, but similar alerts can be built into any electronic system within which the vitals are either fed or automatically monitored. Many EMR systems now offer a variety of patient screening tools with specified communication and treatment algorithms built therein. However, we have found that having a homegrown module has allowed us to make adjustments along the way, particularly in our ICU or pediatric populations, with not only adjustments to SIRS qualifications, but also age specificity and treatment or testing options.
5. Describe how patients, families, and if appropriate, community was included in the work.	The patient is at the center of the automated electronic alert system. The alert exists as a gauge of the patient's current status, regardless of perception, pending discharge status, or admission diagnosis. It is a leveler that requests further evaluation, often a conversation with the patient, or often a conversation with the medical team to initiate treatment. Recent developments in New York State have brought about a Department of Health mandate for all hospitals to adopt sepsis recognition and treatment guidelines. The mandate includes the reporting of treatment compliance and risk-adjusted outcomes beginning mid-2014, with the eventual public reporting by hospital. In this regard, with the sepsis projects pursued by Stony Brook these past years, and particularly with the alert recognition in place, we find ourselves in an advantageous position within the community. These developments have been closely followed by our hospital administration and have received increased acknowledgement at both national and statewide quality venues this past year, including a speaking engagement at the 2013 National Association for Healthcare Quality.
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