

Implementing an EHR-Embedded Electronic Pediatric Sepsis Screening Algorithm at Boston Children's Hospital

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Boston Children's Hospital (BCH) is a freestanding, quaternary-care children's hospital with approximately 400 inpatient beds and 60,000 annual emergency department (ED) visits. The ED treats patients who walk in or are brought by ambulance from the surrounding communities, as well as patients referred in from other hospitals in Massachusetts, New England and further locales.

A sepsis quality improvement team was formed at BCH in 2011, and focused on improving adherence to PALS recommendations for IV access, antibiotic, fluid and pressor administration. In 2014, BCH began implementing a paper form of the Pediatric Septic Shock Collaborative's pediatric sepsis identification tool that aimed to identify children at high risk of sepsis by their vital signs, physical exam findings and previous medical history.

Challenge

Despite significant efforts to introduce this paper form into the ED workflow, compliance was low as all other clinical work was done within the electronic health records (EHR).

Action

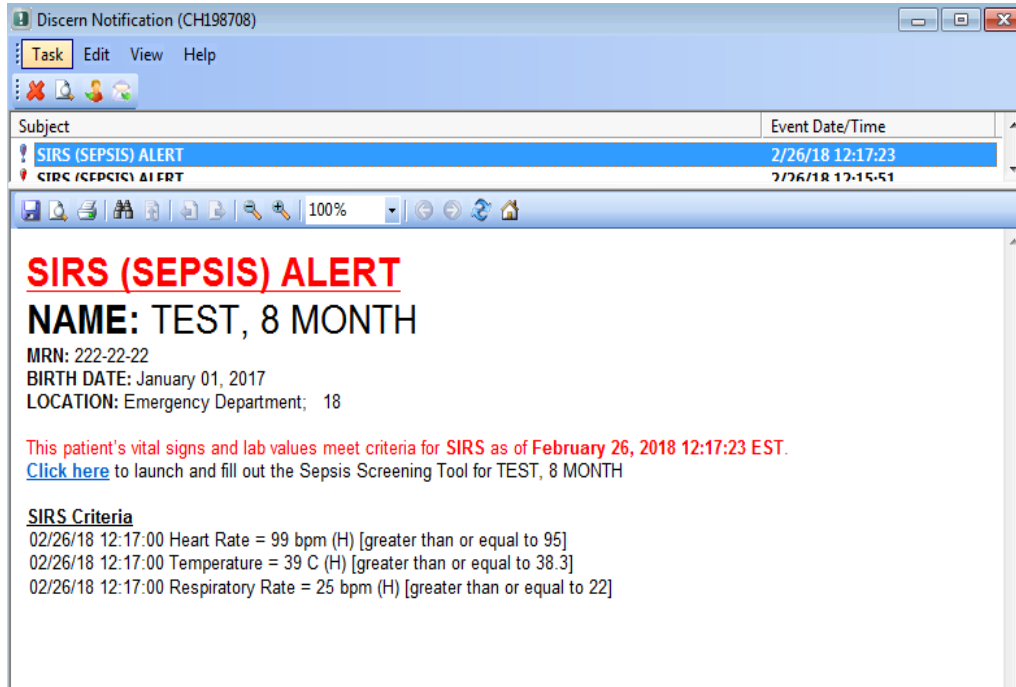
As a result, Boston Children's partnered with Cerner Corporation in 2016 to develop and validate an EHR-embedded pediatric sepsis recognition tool. This tool, which went live on June 5, 2018, provides continuous real-time surveillance of patients' vital signs, laboratory testing and other clinical information from the moment of ED arrival until check-out, and alerts the patient's clinical team via a pop-up message and a tracking board icon when one of 3 alert criteria are met: SIRS, sepsis or severe sepsis.

In order to minimize alert fatigue, physicians and nurses at BCH chose to implement the tool as part of a 2-step process, in which the presence of a SIRS or sepsis alert then triggers an EHR-embedded screening form that is filled out by the triage or bedside nurse. This brief form seeks to differentiate critically ill children from those who have abnormal vital signs due to fever, anxiety or agitation but without other evidence of sepsis. Patients with a positive secondary screen, or a positive "Severe sepsis" alert, prompt a bedside huddle in which the team evaluates the patient for sepsis and chooses whether to activate the septic shock protocol or, alternatively, to deem the patient a "watcher" with close monitoring of vital signs.

Outcomes

While clinical data is not yet available on the effect of the tool on process measures such as time to antibiotics or outcome measures such as mortality and ICU length of stay, the tool has been well integrated into clinical work flows and staff at BCH appreciate the rapid alerts when patient's vital signs and lab values meet thresholds concerning for potential sepsis.

Figure 1a: A Pop-Up Alert Notifying Assigned Providers that Patient Meets SIRS Alert Criteria



The screenshot shows a web-based notification window titled "Discern Notification (CH198708)". The window has a menu bar with "Task", "Edit", "View", and "Help". Below the menu bar is a toolbar with several icons. The main content area is divided into a header section and a body section. The header section contains a table with two columns: "Subject" and "Event Date/Time". The first row is highlighted in blue and contains "SIRS (SEPSIS) ALERT" and "2/26/18 12:17:23". The second row contains "SIRS (SEPSIS) ALERT" and "2/26/18 12:15:51". The body section contains the following text:
SIRS (SEPSIS) ALERT
NAME: TEST, 8 MONTH
MRN: 222-22-22
BIRTH DATE: January 01, 2017
LOCATION: Emergency Department; 18

This patient's vital signs and lab values meet criteria for SIRS as of February 26, 2018 12:17:23 EST.
[Click here](#) to launch and fill out the Sepsis Screening Tool for TEST, 8 MONTH

SIRS Criteria
02/26/18 12:17:00 Heart Rate = 99 bpm (H) [greater than or equal to 95]
02/26/18 12:17:00 Temperature = 39 C (H) [greater than or equal to 38.3]
02/26/18 12:17:00 Respiratory Rate = 25 bpm (H) [greater than or equal to 22]

Figure 1b: Embedded in the alert and accessible from the tracking board is a link to the nurse sepsis screening form. Patients with a positive sepsis screen are evaluated at the bedside by the clinical team (sepsis huddle).

ED Sepsis Screening - Sepsis, Mark Loren

*Performed on: 02/15/18 1302 EST

ED Sepsis Screening

ED Sepsis Screening

Does the patient have fever or do you suspect an infection? Yes No

Does the patient have any of the following:

Altered perfusion/pulses Yes No
Capillary refill > 3 secs or < 1 sec, cool or mottled skin, diffuse flushing/erythroderma, petechiae below the neck or any purpura

Immunocompromise Yes No
History of malignancy on active chemotherapy, asplenia, organ or stem cell transplant, indwelling central line/PICC, severe cerebral palsy, other history of immunosuppressive disease or drug

Altered Mental Status Yes No
Unusually or inappropriately sleepy, irritable or confused

Score:

If score \geq 2, commence a sepsis huddle.

Segoe UI 9

Temperature: 39 DegC High (02/15/18 11:43:36)
Systolic Blood Pressure: 88 mmHg (02/12/18 15:12:36)
Heart Rate: 96 bpm (02/15/18 11:43:36)
Respiratory Rate: 25 br/min (02/15/18 11:43:36)