Patient Safety Tip of the Week

February 2, 2016 Success Against Sepsis

Several recent published reports show that significant progress is being made in reducing mortality from sepsis. The SEPSIS KILLS quality improvement program in Australia showed a linear decrease in mortality from 19.3% in 2009–2011 to 14.1% in 2013 (Burrell 2016). There was also a significant decline in time in intensive care and total length of stay.

The SEPSIS KILLS program provides a sepsis toolkit with protocols for several settings (ED, ward) and pathways for several patient types (adult, pediatric, neonatal, maternal) and other resources, such as a page on escalation triggers. But basically it mirrors the core elements of the Surviving Sepsis Campaign. The key elements of SEPSIS KILLS are:

- RECOGNISE risk factors, signs and symptoms of sepsis
- RESUSCITATE with rapid intravenous fluids and antibiotics
- REFER to senior clinicians and teams

The focus of the program was on emergency departments. The program resulted in substantial increases in patients acutely triaged into either the "see immediately" or "see within 10 minutes" categories. The percentage of patients receiving antibiotics within 60 minutes of triage or recognition increased from 29.3% to 52.2%. And the percentage of patients receiving a second liter of intravenous fluid within one hour increased from 10.6% to 27.5%.

Some of the subset findings, however, were interesting. Mortality rates did not change significantly for those patients with high lactate levels (4 mmol/L or more) or those with what they termed "cryptic shock" (normotension but high lactate levels). But the group with hypotension and non-elevated lactate levels saw a decline in mortality rate from 16.5% to 9.8%. And the mortality rates for those with severe sepsis admitted to either the ICU or the ward did not change significantly over time. The authors actually noted it was bothersome that at the end of the study the mortality rates for those with severe sepsis admitted to wards was higher than for those admitted to ICU's. They felt this might reflect an underappreciation of the potential mortality of sepsis. Also troubling was the fact that there was actually an increase over time in the mortality for patients with "uncomplicated" sepsis (3.7% to 6.7%).

The second publication was an article in Hospitals and Health Networks that summarized remarkable reductions in sepsis mortality in two multi-hospital systems (Butcher 2016). North Shore-Long Island Jewish Health System, partnering with the Institute for Healthcare Improvement (IHI), began a multidisciplinary program at its 15 hospitals

aimed at sepsis in 2010 and achieved a 50% reduction in sepsis mortality by 2014. And Intermountain Healthcare, also with 15 hospitals, cut its sepsis mortality rate from 20.2% to less than 9% over a 6 year period.

Keys to success were re-engineering emergency department processes to screen for sepsis and administer early antibiotics and fluids to patients with sepsis and return serum lactate levels promptly to physicians so they could recognize cases of severe sepsis. The North Shore-LIJ program also attributed success to being widely inclusive of all parts of the organization in the planning process and ongoing (biweekly) conference calls where both progress and challenges were discussed.

Intermountain attributed their success to implementation of care bundles that achieved 80% compliance plus refinement of their data systems so that reporting was both more accurate and more real-time. They also were able to look at variations in performance across sites in their system to identify barriers and improve performance.

Prompt recognition of sepsis is the key because it obviously is the step necessary before early administration of antibiotics and fluid resuscitation. In our September 8, 2015 Patient Safety Tip of the Week "TREWScore for Early Recognition of Sepsis" we discussed the contributions made by early warning scores, such as the TREWScore (Henry 2015), that help identify sepsis or severe sepsis earlier. And in our October 2015 What's New in the Patient Safety World column "Even Earlier Recognition of Severe Sepsis" we noted a tool used by EMS personnel (Polito 2015) to help identify sepsis in patients before they even reach the hospital.

Early and adequate fluid resuscitation is a critical part of sepsis management. This has long been recognized but we think it inadvertently led to unintended barriers to sepsis care. Many of the early sepsis protocols called for a goal-directed therapy (EGDT) protocol, which included the invasive monitoring. We think many centers shied away from aggressive fluid management because of that requirement for central lines. But, fortunately, the randomized ProCESS trial (The ProCESS Investigators 2014) demonstrated that invasive monitoring did not improve outcomes (our April 1, 2014 Patient Safety Tip of the Week "Expensive Aspects of Sepsis Protocol Debunked"). Ever since our residency days we'd take great pride in showing our colleagues how a passive leg raise or equivalent can help with decisions about fluid/hemodynamic status in patients, avoiding the need for invasive monitoring.

The Australian study (Burrell 2016) also noted one particular challenge was educating a high turnover workforce in emergency departments and medical engagement in rural facilities. Our experience suggests this comment likely extends to the US as well. The physician staffing of rural ED's often relies on physicians coming from substantial distances and staying only for one shift or only for several shifts. This makes it very difficult to ensure they have been updated when new or amended protocols have been put in place.

The Australian study also noted a major challenge in antibiotic prescribing. While the program did have a system-wide suggested empiric antibiotic guideline, each site was allowed to modify it. There seemed to be considerable anxiety over use of gentamycin. Also, the authors felt there might have been more timely revision of antibiotic regimens once lab reports became available.

Despite some of our concerns that the perceived improvements in sepsis morbidity and mortality over the last decade may actually have been artifacts due to changes in hospital coding practices (see our April 1, 2014 Patient Safety Tip of the Week "Expensive Aspects of Sepsis Protocol Debunked"), it appears that improvements in early recognition, timely antibiotics and adequate fluid resuscitation have indeed resulted in reduced mortality from sepsis.

You may find some of the tools in the SEPSIS KILLS toolkit complement those in the Surviving Sepsis Campaign.

Our other columns on sepsis:

- March 15, 2011 "Early Warnings for Sepsis"
- April 1, 2014 "Expensive Aspects of Sepsis Protocol Debunked"
- September 8, 2015 "TREWScore for Early Recognition of Sepsis"
- October 2015 "Even Earlier Recognition of Severe Sepsis"

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