

Patient Safety Tip of the Week

November 11, 2014

Early Detection of Clinical Deterioration

In our July 15, 2014 Patient Safety Tip of the Week “[Barriers to Success of Early Warning Systems](#)” we again lamented the fact that early warning systems (EWS) to detect clinical deterioration of patients earlier have yet largely failed to live up to their promise. While the logic behind such scoring systems seems well-founded there has been a paucity of high-level evidence that such systems lead to substantial improvement in patient outcomes. Because of that and other factors, hospitals in the US have been very reluctant to adopt early warning scores into routine practice even as hospitals in the UK have been mandated to adopt such systems.

In that column we discussed an excellent study in the nursing literature ([Watson 2014](#)) that provided great insight into the barriers that impact implementation of an early warning system. Some of those barriers included:

- 1) Delays in charting vital signs
- 2) Poor consistency between charted vital signs and those used in the early warning systems (EWS)
- 3) Multi-tasking by RN's
- 4) Recording vital signs first on paper, later entering into the computer
- 5) Lack of computer availability or functionality
- 6) Excess log-on times
- 7) Preference for not charting in front of patient/family
- 8) Lack of incorporating the RN's impression of the patient status into the EWS
- 9) General perception by RN's that the EWS was no better at predicting deterioration than their own clinical impression

Watson and colleagues suggested changes to the physical environment and improved technology interfaces to support real-time data entry as ways to improve usefulness of the EWS:

- 1) Bedside computer access or use of smartphones or tablets for documentation
- 2) Have EMR's automatically populate VS into the early warning score tool
- 3) Re-examination of RN and non-RN tasks, perhaps returning VS assessment to RN's so that data collection and documentation would be integrated
- 4) Add RN concerns or family concerns to the criteria for the score

Now a new study that included many of those recommended practices into an EWS implementation has documented substantial improvement in mortality ([Schmidt 2014](#)). They implemented at two general hospitals in England an electronic physiological surveillance system (EPSS) which uses wireless handheld computing devices to replace a paper-based vital sign charting and clinical escalation system. After implementation of the system crude mortality for 56 diagnostic groups fell from 7.75% to 6.42% in one hospital and from 7.57% to 6.15% at the second hospital. They conclude that using technology specifically designed to improve the accuracy, reliability and availability of patients' vital signs and early warning scores allows early recognition of and response to patient deterioration, resulting in improved mortality rates

In our February 22, 2011 Patient Safety Tip of the Week "[Rethinking Alarms](#)" we highlighted a paper by Lynn and Curry ([Lynn 2011](#)) that described 3 patterns of unexpected in-hospital deaths and discussed the problems with threshold-based alarms (almost all currently used alarm systems use threshold-based principles) in detecting early deterioration. Indeed, they posit that threshold-based alarms themselves often cause us to miss signs of early deterioration and make a case for implementation of "smart" alarms that integrate clinical data from multiple sources. The core concept of early warning systems, of course, is that using multiple factors should facilitate identification of clinical deterioration rather than just using a single factor.

In a very thoughtful commentary on the Schmidt study, David Bates and Eyal Zimlichman ([Bates 2014](#)) note the confluence of four major trends that should help overcome the barriers noted above. They note that the near-universal use of electronic medical records, better physiological sensors, background analytics, and mobile technology should facilitate earlier detection of clinical deterioration. They note that the Schmidt study still relied on intermittent vital sign measurement rather than using more continuous physiological measurements. So the potential to further improve this system is even greater. They do, however, note that the danger of alert fatigue might raise its ugly head and recommend caution and the need to address the false positive issue. They also acknowledge the importance of recognizing sociotechnical factors that might undermine such systems.

Hospitals have more and more adopted use of "middleware" and alerts delivered via mobile technologies to direct conditions needing attention to the healthcare workers who should provide that attention. That obviously is the wave of the future. It minimizes the "noise" of alerts and alarms going to everybody and gets them to the staff accountable for responses. But even then issues may arise. In our February 4, 2014 Patient Safety Tip of the Week "[But What If the Battery Runs Low?](#)" we noted a scenario where a patient event triggers an alarm that is sent to the primary nurse expected to respond but the battery in her cell phone has failed and she never receives the alert. Fortunately, the escalation procedure built into your system sends the alert to a secondary nurse who responds to the patient and no harm comes to the patient. Technological advances solve multiple problems but may introduce new potential problems as well.

In a related issue, early warning systems (EWS), of course, are intimately tied to rapid response teams (RRT's) and rapid response systems (RRS's). Like the evidence base for EWS, the evidence base for the success of RRT's and RRS's in improving patient outcomes has been mixed at best. The Medical Journal of Australia has just indicated it will be doing a series of articles exploring how RRS's have changed approaches to patient safety, influenced end-of-life care, and the changing nature of cardiopulmonary arrest teams ([Hillman 2014](#)). One issue that has always popped up regarding both RRT's and cardiopulmonary arrest teams is whether adverse events occur in other locations when team members have to abandon those locations to respond to the emergencies elsewhere. A new study answers that question ([Concord MET Study 2014](#)). The bad news is that disruptions of normal care routines and inconvenience to staff do occur in such situations. The good news is that it is very rare for adverse events or patient harm to come about because of those events.

Hopefully the new work by Schmidt and colleagues will rekindle interest in both early warning systems (EWS) and rapid response systems (RRS). As we have mentioned in several of our own columns on rapid response teams, the problem is not with the response teams. Rather it is with our poor recognition of early clinical deterioration.

Some of our other columns on MEWS or recognition of clinical deterioration:

- February 26, 2008 "[Nightmares: The Hospital at Night](#)"
- April 2009 "[Early Emergency Team Calls Reduce Serious Adverse Events](#)"
- December 15, 2009 "[The Weekend Effect](#)"
- December 29, 2009 "[Recognizing Deteriorating Patients](#)"
- February 22, 2011 "[Rethinking Alarms](#)"
- March 15, 2011 "[Early Warnings for Sepsis](#)"
- October 18, 2011 "[High Risk Surgical Patients](#)"
- March 2012 "[Value of an Expanded Early Warning System Score](#)"
- September 11, 2012 "[In Search of the Ideal Early Warning Score](#)"
- May 2013 "[Ireland First to Adopt National Early Warning Score](#)"
- September 17, 2013 "[First MEWS, Now PEWS](#)"
- January 2014 "[It MEOWS But Doesn't Purr](#)"
- March 11, 2014 "[We Miss the Graphic Flowchart!](#)"
- July 15, 2014 "[Barriers to Success of Early Warning Systems](#)"

Our other columns on rapid response teams:

- August 2007 "[Responding to Patients with Clinical Deterioration](#)"
- November 27, 2007 "[More on Rapid Response Teams](#)"
- August 2008 "[AHRQ's New Patient Safety Primers](#)"
- December 2008 "[Rapid Response Teams Don't Live Up to Expectations](#)".
- April 2009 "[Early Emergency Team Calls Reduce Serious Adverse Events](#)"

- December 29, 2009 “[Recognizing Deteriorating Patients](#)”.
- February 2010 “[Rapid Response Teams Still Not Cutting It](#)”

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