

Early Recognition and Intervention of Critical Illness in At-Risk Hospitalized Patients Outside the ICU

Background

The Institute of Medicine (IOM, 1999) published *To Err is Human: Building a Safer Health System*, estimated that approximately 100,000 hospital deaths were preventable. A more recent study (2013) using a weighted average of four studies estimated a lower limit of 210,000 preventable hospital deaths per year. Given limitations in the search tool used in the study and the incompleteness of medical records on which the tool depends, the true number of premature hospital deaths associated with preventable harm was estimated at more than **400,000 per year**. Serious harm without death has been suggested to be 10- to 20-fold more common than lethal harm, possibly representing as many as **4 to 8 million U.S. patients per year or up to 25% of annual U.S. hospital admissions**. In 2010, CMS began monitoring hospital failure to rescue rates (FTR), with the most recent US rate reported to be **13.7%** of hospitalized patients. This is supported by the observation that 80% of unexpected general ward cardiac arrests are preventable (e.g., progressive clinical deterioration leading to pulseless electrical activity - PEA). Thus, in-hospital FTR is an enormous problem. In a national review (2005) of UK patients subsequently transferred to the ICU, many had sustained up to 72 hours physiological instability. Analysis (2014) of hospital deaths in another UK database found that *“the most common incident types were failure to act on or recognize deterioration”*

As a consequence of the original report, IOM along with Institute of Health Improvement (2005 100,000 lives campaign), The Joint Commission, SCCM, and others recommended that hospitals address this problem. In 2007, the United Kingdom’s **National Institute of Health and Care Excellence (NICE)** published a clinical guideline [CG50] entitled, *“Acutely ill adults in hospital: recognizing and responding to deterioration”* that advocated for Early Warning Scores (EWS) throughout the U.K. In response to these initiatives, hospitals implemented systems to recognize and respond to general ward at-risk patients, resulting in the development and implementation of Rapid Response Systems (RRS). These systems are ubiquitous among in-patient environments throughout the developed world, albeit **often with limited success**.

In the US in late 90s in response to the above problem Rapid Response Systems (RRS) were being independently developed and implemented at the University of Pittsburgh and Redding Medical Center in Redding California among other locations. These RRS were designed to recognize early and promptly intervene on patients at-risk for critical illness outside the ICU.

Even with mature successful RRS, system processes and procedures that positively affect patient outcomes were not well described or understood. However, this is changing with recent work and publications describing successful system components that are not difficult to implement and if widely disseminated could positively affect the lives of thousands of hospitalized patients.

Early and accurate event detection coupled with best practice interventions is the goal and thrust of RRS initiatives. As with mature robust RRS, that improve outcomes, allocating resources for afferent arm/ bedside nurse for early event detection is key. To do this the hospital needs a comprehensive education programs coupled with easy to audit compliance procedure for bedside clinicians to assure that they accurately obtain and understand easily measured bedside parameters or vital signs. These parameters are used singularly or in combination, as an early warning scoring system to increase concern for patients at-risk and prompt mobilization of appropriate resources. Abnormalities in these key Vital Signs i.e. mental status, temperature, respiratory rate, heart rate, blood pressure, SaO₂, capillary refill time, urine output, base deficit or lactic acid etc. can often represent early hypoxia or hypoperfusion which, if promptly appreciated will improve outcomes of patients at-risk for critical illness outside the ICU.

Problem

No one would dispute that vital signs are vital and an essential part of any patient exam yet, there are often scant hospital resources devoted to teaching the importance of accurately obtaining, understanding and when indicated acting upon key patient VS measures on general wards patients. It is well documented that respiratory rate, the sentinel vital sign of clinical decline is often estimated with an erroneous value recorded in the charts of the majority of general ward patients. Its rate is utilized by all at-risk patient early warning scores/ systems; rendering any particular system less useful by the phenomena of “*garbage in...garbage out*”. The problem of inaccurate basic vital patient data (Temp, HR, BP, RR) in the EMR is compounded underappreciation of the importance of early abnormalities in mental status (MS) and peripheral perfusion. Currently, the most commonly used MS scale (i.e. GCS or AVPU) do not pick up **agitation, anxiety or apathy**, all of which are common early indicators of clinical deterioration thus many patients in the first stages of clinical decline are missed.

These shortcomings are taking place in the setting of increased utilization of new technology where clinicians rely less on physical exam and more on, easy to order but costly, tests that take longer to get the results than a thorough patient exam and may add little value. This de-emphasis of the hands-on bedside patient assessment is reinforced by requirements of EMR documentation necessitating more time in front of a computer screen and less time to examine the patient. An example of this is Capillary refill time (CRT) a bedside measure of peripheral perfusion, which all nurses know how to perform and is quick and easy to obtain, has been shown to be the single best predictor for transfer to ICU once an RRS alert has been called when its value is > 3 sec. It has also been demonstrated to be a good predictor of progressing to subsequent organ failure and mortality. Despite significant data showing its usefulness only a few hospitals use this CRT to assist in early detection of clinical decline.

Increasing awareness of these issues and attention to fundamentally important, not difficult to obtain, bedside patient assessments will detect early patients at-risk for clinical decline; and when coupled with appropriate education and compliance measures, will trigger prompt intervention that will improve outcomes. This is all very basic patient care and the benefit of focusing on the basics can be greater and less expensive than focusing on more time-consuming, costly evaluations that frequently do not add much information to an understood quick and focused bedside exam.

Goal

Increase the awareness, acceptance and subsequent compliance in obtaining, understanding and appropriately acting on, in near real-time, easily measured expanded bedside parameters/vital signs on patients in less intensely monitored locations (i.e. general wards, ED etc.). If we do this, morbidity, mortality, suffering and cost brought about by delayed recognition of patients at-risk for critical illness outside the ICU should be improved.

Solutions

- The SCCM and the College of Critical Care Medicine has just convened an international task force involving interested stakeholders including nursing, physicians, respiratory therapy, etc. This task force will rereview the literature with the goal of publishing hospital FTR guidelines based on the evidence. These guidelines will recommend adoption/ implementation of proven processes and procedures that will likely reduce morbidity, mortality and cost of patients at-risk for critical illness outside the ICU.
- Educational efforts at a local, regional and national level (i.e. SCCM, ISRRS annual educational conferences) to increase awareness of and solutions to the problem.
- Determine Key Performance Indicators that will Measure Improvement in Reducing Failure to Rescue. Ones that have been used in the past include:
 - Incidence of general ward unanticipated Cardiac Arrest rate /1000 admissions
 - Number of RRS alerts/1000 admissions
 - Presence and use by nursing of an Early Warning Criteria/Score
 - Presence of educational efforts for frontline bedside providers (Nursing and Physicians) on early recognition of clinical decline.
- Launch an International Campaign to Emphasize: *“Reduce Failure to Rescue - Back to basics - back to the bedside”* starting with *“Making the Vital Signs Count Again”*

Expected impact

- Reduction in hospital patient morbidity, mortality suffering and cost associated with delayed recognition of clinical decline outside the ICU.
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- About 25% of RRS patients transferred to ICUs could have been recognized sooner and therefore less sick. The critical care resource and bed shortage will likely improve, as these patients are

recognized sooner and will be less moribund and resulting in shorter ICU LOS and lower mortality.

- Approximately 30% general ward at-risk patients are septic, which is an important area of focus. Outcomes of these patients will improve through earlier recognition through more accurate measurement and better understanding of RR, MS, Capillary Refill Time, etc. evaluations as a key part of sepsis program with earlier delivery of the sepsis bundle.
- As many as 10% of RRS patients need their resuscitation status changed to better match patient goals of care with indicated interventions. This is another important function of RRS that provides prompt patient/family centered dialogue at critical points of change in patient condition. Improving the quality of life for those patients who will not benefit from or do not want more aggressive care

Follow up

If your hospital or system is interested in more information or further discussion regarding points made in this document we are happy to assist and do not charge or financially benefit from this activity.

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Bibliography

James JT. A new, evidence-based estimate of patient harms associated with hospital care. Journal of patient safety 2013;9:122-8.

Hillman KM, Bristow PJ, Chey T, et al. Antecedents to hospital deaths. Internal medicine journal 2001;31:343-8.

Hodgetts TJ, Kenward G, Vlackonikolis I, et al. Incidence, location and reasons for avoidable in-hospital cardiac arrest in a district general hospital. Resuscitation 2002;54:115-23.

UK National Institute for Health Care Excellence (NICE). Acutely ill adults in hospital: recognising acutely ill adults in hospital and responding to deterioration. Clinical Guideline 2007. nice.org.uk/guidance/cg50. Accessed 8/1/2018

Donaldson LJ, Panesar SS, Darzi A. Patient-safety-related hospital deaths in England: thematic analysis of incidents reported to a national database, 2010-2012. *PLoS medicine* 2014;11:e1001667.

Sebat F, Vandegrift MA, Childers S, Lighthall GK. A Novel Bedside-Focused Ward Surveillance and Response System. *Joint Commission journal on quality and patient safety* 2018;44:94-100.

Nishijima I, Oyadomari S, Maedomari S, et al. Use of a modified early warning score system to reduce the rate of in-hospital cardiac arrest. *Journal of intensive care* 2016;4:12.

Bannard-Smith J, Lighthall GK, Subbe CP, et al. Clinical outcomes of patients seen by Rapid Response Teams: A template for benchmarking international teams. *Resuscitation* 2016;107:7-12.

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Value of Capillary Refill to Identify Patients at Risk of Transfer to Higher Level of Care or Death
2019 (abstract SCCM Congress Feb 2018) **Manuscript submitted for publication**

Kramer, Sebat, Lissauer *A Review of Early Warning Scores for Prompt Detection of Patients at Risk for Clinical Decline* *Journal of Trauma and Acute Care Surgery* 2019 in press

Pat Laughlin PhD, Frank Sebat MD, John Kellet MD *Respiratory Rate the forgotten Vital Sign- Make It Count Again!* *Joint Commission Journal on Quality and Patient Safety*,
Sept 2018 2018; 44:494–499

J Kellet, F Sebat *“Making Vital Signs Great Again – A Call for Action”*, *European Journal of Internal Medicine* Sept 2017

Duane Funk, Frank Sebat, Anand Kumara. *“A Systems Approach to the Early Recognition and Rapid Administration of Best Practice Therapy In Sepsis June 2009 Septic Shock.”* *Current Opinion in Critical Care*.

Frank Sebat, MS, MD, et al *“Designing, Implementing and Enhancing a Rapid Response System.”* Text book published by Society of Critical Care Medicine. Jan 2009

Frank Sebat M.S., M.D., Amjad A. Musthafa, M.D., David Johnson M.D., Andrew A. Kramer, Ph.D. et al, *“Effect of a rapid response system for patients in shock on time to treatment and mortality over five years.”. Critical care medicine, November 2007Vol. 35, No. 1, pp. 2568-2575.*

Additional information/resources are available at kritikusfoundation.org