SPACELABS HEALTHCARE

The Rothman Index - Shifting from Reactive to Proactive Care Delivery

Strategies for Improving the Effectiveness of Rapid Response Teams

Empowered by predictive analytics, Rapid Response Teams are being reinvented to fulfill a proactive role that drives earlier clinical intervention and advances the goal of reducing failure-to-rescue events.

EXECUTIVE SUMMARY
A growing number of hospitals are finding that the Rapid Response Team (RRT) model can be reinvented to drive earlier clinical intervention and significantly improve patient outcomes. By developing clinical care initiatives that leverage a proactive RRT model together with clinical deterioration surveillance solutions, hospitals have found a successful strategy for achieving the long-awaited benefits of RRTs.

The Rothman® Index helps RRT clinicians proactively identify and prioritize patients for review and possible intervention. By supporting the work of daily RRT clinician rounding and calling attention to patients of particular concern, the Rothman Index helps to focus RRT expertise where it is needed most. RRTs can rely on the real-time view of patient condition and the early warning of deterioration that the Rothman Index provides. By helping to shift RRTs out of a reactive operational mode, the value and expertise of RRT resources can be more effectively deployed and more fully utilized to the benefit of patients and the healthcare organization as a whole.

This approach has helped multiple organizations, including Yale New Haven Hospital, St. Raphael Campus and Houston Methodist Hospital, reduce inpatient mortality rates by up to 30%. Other hospitals have seen substantial reductions in sepsis-related mortality while simultaneously driving down the cost of care for sepsis patients. Organizations, such as University Health System in San Antonio have achieved significant reductions in code blue events.

Integrating the Rothman Index into daily workflow allows clinicians to take a more active and effective role in intervening early on patients of concern and collaborating with the patient's care team to address potential problems sooner. Ensuring attention is focused on at-risk patients, proactively reviewing treatment plans, and re-establishing appropriate care levels is a simple but powerful formula for minimizing adverse events and preventing avoidable crises. This strategy is fundamental to the quality improvement concept of putting the right patient in the right bed at the right time.

REDUCING MORTALITY WITH A ROTHMAN INDEX SUPPORTED RAPID RESPONSE TEAM

Clinical care redesigns that include the Rothman Index have allowed numerous hospitals to achieve improvements in patient outcomes. In particular, implementing proactive RRTs in conjunction with the Rothman Index is a powerful combination that empowers RRT-initiated patient rounding. This allows interventions and changes in care plans to be made earlier and more effectively than might otherwise be the case.

Following the implementation of a clinical care redesign that included a dedicated proactive RRT and Rothman Index surveillance technology, Yale New Haven Hospital, Saint Raphael Campus saw a 30% reduction in raw mortality relative to a historical control.[1] Over the same time period, its sister campus, Yale New Haven Hospital, did not have any change in mortality.[1] Using a similar care delivery process, another hospital in the system, Bridgeport Hospital, was able to reduce sepsis mortality by 29% and the cost of care for sepsis patients by 13%.

Houston Methodist Hospital implemented a care redesign which included Rothman Index guided nurse practitioner rounding, and achieved a subsequent reduction in risk-adjusted mortality of 32% relative to both concurrent and historical control groups.[2] Figure 1 shows the Mortality Index for eleven nursing units as computed with the University Health System Consortium mortality model for the 9 months prior to initiation of surveillance protocols (historical control) and for the 9-month intervention period. Also shown is a second concurrent control, the mortality index from nonintervention
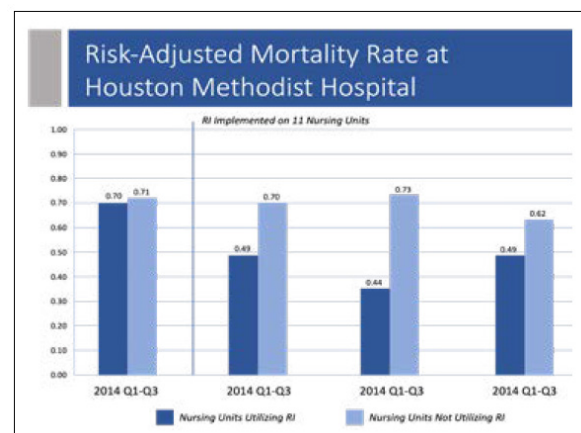

Figure 1 - Risk-Adjusted Mortality Rate[2]

nursing units (20 units) through the entire 18-month period. Risk-adjusted mortality decreased 32% (0.7 to 0.48), p-value < 0.001. The study included 33,797 patient visits from Houston Methodist Hospital (889 beds).

Similarly, University Hospital - San Antonio, deployed a proactive RRT which leveraged the Rothman Index to achieve a 30% reduction in code blue events.[3]

THE STANDARD RAPID RESPONSE TEAM MODEL CAN BE IMPROVED
In 2004, as part of the 100,000 Lives Campaign, the Institute for Healthcare Improvement (IHI) recommended that hospitals deploy rapid response teams (RRTs), or groups of critical care clinicians trained to act quickly when a patient's condition declines. The goal was to combat "failure to rescue," which occurs when opportunities to recognize the risk of patient deterioration and intervene earlier are missed. By 2010, over half of US hospitals had responded to IHI's call and implemented an RRT.[5] While there is a slowly emerging base of evidence that RRTs may have some efficacy in reducing cardiac and pulmonary arrests and mortality as originally hoped,[5,8] the effective deployment of RRTs remains a significant challenge.

Consider that an RRT's ability to intervene on patients to avoid serious events first requires the ability to identify which patients the RRT team should see. Traditional RRTs operate reactively, responding to calls from nurses, concerned family members, or acting on alerts that are automatically generated by deviations in vital signs. There are multiple problems with this approach.

First, the ability of the RRT to operate depends on it being called into action by another person or system. This dependency is a limiting factor which prevents a team with significant clinical expertise to ever take the initiative in improving patient care.

For a dozen years, the ability of RRTs to effectively reduce adverse patient events has failed to meet expectations.[6,7]

Second, the basis for many RRT calls – often formalized in protocols – is clinician concern related to patient deterioration. The vast amount of clinical data available in the hospital, coupled with known problems in continuity of care (due to the succession of nurses and physicians with responsibility for a patient) make it incredibly difficult for any clinician to confidently detect when a patient is showing early signs of deterioration. By the time deterioration is obvious, the opportunity for early intervention has often been lost.

Third, RRT calls that are predicated on alerts that are driven by vital signs are problematic. Even in the most sophisticated hospitals with established RRT protocols based on alerts from early warning systems, the warning systems used are typically vital sign based versions of the Modified Early Warning Score (MEWS) or National Early Warning Score (NEWS). Almost by defintion these systems cannot meet the need of prompting sufficiently early intervention. By the time a patient begins to decompensate and their vital signs change for the worse, the opportunity has been lost for preemptive action that might have avoided or minimized the problem. Moreover, these common scores are known to suffer from high rates of false positives leading to alert fatigue and leading to inefficient utilization of RRT resources.

RRTs that are activated by vital-sign based early warning systems such as MEWS do not achieve their full potential for effective early intervention.

THE PROACTIVE RAPID RESPONSE TEAM MODEL
The actions the RRT clinical resources take can also be improved upon when armed with an effective supporting tool such as the Rothman Index. By flipping the RRT model and making RRT clinical staff proactive, rather than reactive, the original goal of intervening early on patients and changing the patient's care trajectory can be accomplished. Published research has shown that changes in the Rothman Index is predictive of when RRTs are called[9], confirming the value of the Rothman Index as a tool to guide RRTs proactively. Thus, instead of waiting for a call from a floor nurse, or waiting for vital signs to deviate to the point a MEWS-type alert is fired, proactive RRTs can use the Rothman Index to actively monitor the patient population and independently decide which patients should be checked on.

The Rothman Index is a natural companion tool for proactive Rapid Response Teams which depend on having early insights into a patient's evolving condition.

A proactive model (shown below) empowers RRTs to become a real front-line system geared towards improved care delivery. Shifting away from an operational mode where RRTs respond to emerging problems and instead having RRT resources take the initiative in supporting clinicians on the floor transforms a crisis-management role into a collaborative care-improvement role.

Proactive Model

1 **Review All Patients in One Place**
Spend the first 30 - 60 minutes at the start of shift reviewing the Rothman Index graphs by the unit, for the whole hospital.

2 **Investigate Patients of Concern**
Review details and progress notes of all patients who are of concern. If there is any doubt about the patient, place them on the RRT nurses' census.

3 **Visit Patients at Bedside**
Round on the patients placed on the RRT nurses' census to further review the patients'condition.

4 **Coordinate with Primary Care Team**
Coordinate with the primary nurse, charge nurse, physician, and respiratory therapist to further evaluate patients of concern and causes of low or declining trends. Involve all members of the team to highlight different perspectives on the health and safety of that individual patient.

5 **Intervene if Necessary**
Assist the care team with any interventions or transfer to a higher level of care that may be necessary.

6 **Record Events**
Record a summary of events in the EHR.

7 **Shift Hand-off**
Integrate data, actions taken, and next steps into existing care hand-off communication plan.

INTEGRATING THE ROTHMAN INDEX INTO PROACTIVE RAPID RESPONSE TEAM ROUNDING

The Rothman Index can be used to guide RRT workflow. Instead of waiting for unit nurses to alert RRT staff about an at-risk patient, an RRT staff member can view the Rothman Index through the EHR or on a dedicated kiosk and quickly see which patients might benefit from an RRT consult. Customized risk warnings can be set to trigger based on a patient's Rothman Index trend or score, allowing for graded acuity alerts that support an appropriately prioritized response.

Figure 2 - RI (Array View)

Based on discussions with numerous RRT nurses at multiple customer hospitals, it is clear that effectively integrating the Rothman Index with RRT daily workflow is a key aspect of optimizing the positive impact that a proactive RRT can have. Hospitals that have adopted the proactive RRT approach using the Rothman Index have consistently reported that once floor nurses are trained on the Rothman Index and have become accustomed to the new RRT model, they appreciate the fact that RRT nurses are actively providing backup support and serving as an independent safety net for patients.

A STRATEGY THAT ADVANCES THE GOAL OF PATIENT SAFETY

More than twenty years have passed since RRTs were first recommended by IHI. The original goal of RRTs to reduce failure-to-rescue cases has proven surprisingly elusive, as evidenced by lackluster improvements in outcomes. Finally, however, the industry has reached a turning point with the successful convergence of people, processes, and technology. It is now clear that a successful strategy can be achieved by the deployment of dedicated RRT resources who take a pro-active approach guided by Rothman Index powered tools.

This Rapid Response Team model has been successfully replicated at multiple hospitals resulting in rapid, measurable care delivery improvements. Most important of all, this strategy has consistently shown an ability to reduce the most expensive and serious events, such as code blues and patient mortality, saving countless patient lives in the process.

REFERENCES

1 M. Rothman, J. Rimar, S. Coonan, S. Allegretto, and T. Balcezak, "Mortality Reduction Associated with Proactive Use of EMR-Based Acuity Score by an RN Team at an Urban Hospital," BMJ Qual. Saf., 24 [11] 734–735 (2015).

2 K. Walsh, S. Hamlin, and B. Askary, "Mortality Reduction Associated with Surveillance Using an EMR-Based Acuity Score at an Academic Medical Center," BMJ Qual. Saf., 25 [12] 1014–1015 (2016).

3 V. Blas and E. Vandermeulen, "Caring Around the Clock: Proactive Rounding by the RRT Nurse Using PeraTrend;" in National Teaching Institute and Critical Care Exposition, 2016.

4 J. Nosta, "Medical Tech Or Personal Touch? PeraHealth Has Cracked The Code," Forbes.com, (2017).

5 R.S. Solomon, G.S. Corwin, D.C. Barclay, S.F. Quddusi, and M.D. Dannenberg, "Effectiveness of rapid response teams on rates of in-hospital cardiopulmonary arrest and mortality: A systematic review and meta-analysis," J. Hosp. Med., 11 [6] 438–445 (2016).

6 K. White, I.A. Scott, A. Vaux, and C.M. Sullivan, "Rapid response teams in adult hospitals: time for another look?," Intern. Med. J., 45 [12] 1211–1220 (2015).

7 A. Subramaniam, J. Botha, and R. Tiruvoipati, "The limitations in implementing and operating a rapid response system," Intern. Med. J., 46 [10] 1139–1145 (2016).

8 R. Maharaj, I. Raffaele, and J. Wendon, "Rapid response systems: a systematic review and meta-analysis," Crit. Care Lond. Engl., 19 254 (2015).

9 B.C. Wengerter, K.Y. Pei, D. Asuzu, and K.A. Davis, "Rothman Index variability predicts clinical deterioration and rapid response activation," Am. J. Surg., (2017).

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