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Patient Condition Index Tool Stratifies *At Risk Patients;*
Improving Critical Thinking in a Complex Environment

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BACKGROUND

The Rothman Index[1] (RI) is a quantitative, general measure of patient condition, *independent of diagnosis and in light of treatment*. It is used for adult, medical-surgical patients age 18 years and older. Below are graphs displaying RI scores of 4 sequential hospitalizations of a single patient. The patient is deteriorating over time.
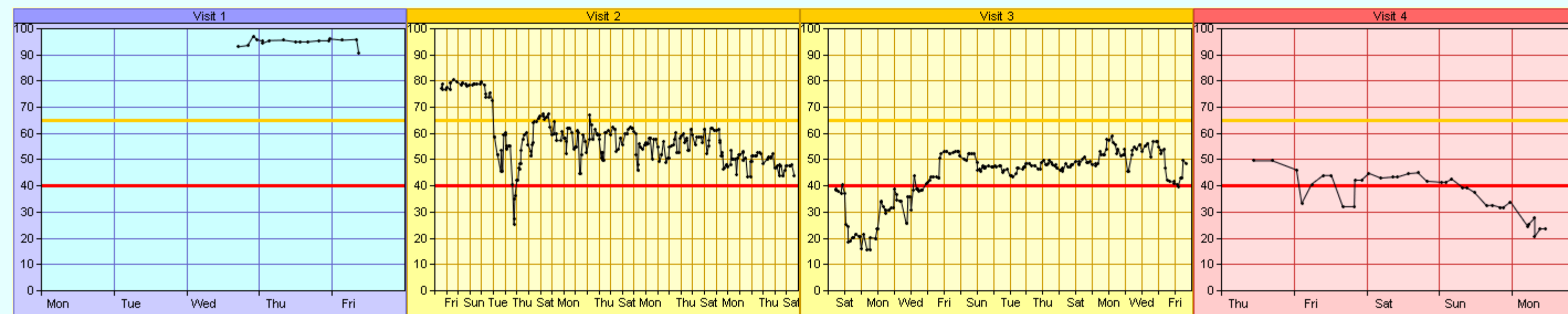
[1] The Rothman Index is displayed via PeraTrend software, a product of PeraHealth (formerly Rothman Healthcare).

Implementation of the Rothman Index at Yale-New Haven Hospital has been a joint venture of the Department of Patient Services and Decision Support. Nursing staff have completed training on its use, and implementation continues for physician staff and other clinicians (e.g., pharmacists, respiratory therapists). As use of the RI expands, exploration by interdisciplinary teams will be done to assess the tool's value in addressing multiple issues including nurse-sensitive outcomes, hospital readmissions, ICU readmissions, rapid response team (RRT) initiation, and nurse staffing.

PURPOSE

To explore the value of the Rothman Index in identifying patients at higher risk of dying while hospitalized if they develop a central line-associated blood stream infection (CLABSI).

SIGNIFICANCE

The ability to identify patients *at risk* for particularly poor outcomes that are amenable to nursing interventions may allow for early detection of patient deterioration and initiation of pre-emptive nursing care. Initiating such efforts to prevent, detect, or quickly rescue patients at risk for hospital acquired infections, including CLABSIs, has the potential to positively affect both patients and hospitals.

MATERIALS and METHODS

The Rothman Index is a single score generated using 26 clinical data elements including vital signs, lab values, and nursing assessments. The clinical data elements are automatically extracted each hour from the EMR and a new score is generated. For a patient's first RI to be calculated, 2 items must be available: a set of vital signs and a minimum of 9 of 11 nursing assessment categories completed. The RI is displayed graphically and is color-coded according to *48-hour risk of mortality or transfer to hospice*: blue (lowest risk), yellow (moderate risk) or red (highest risk).
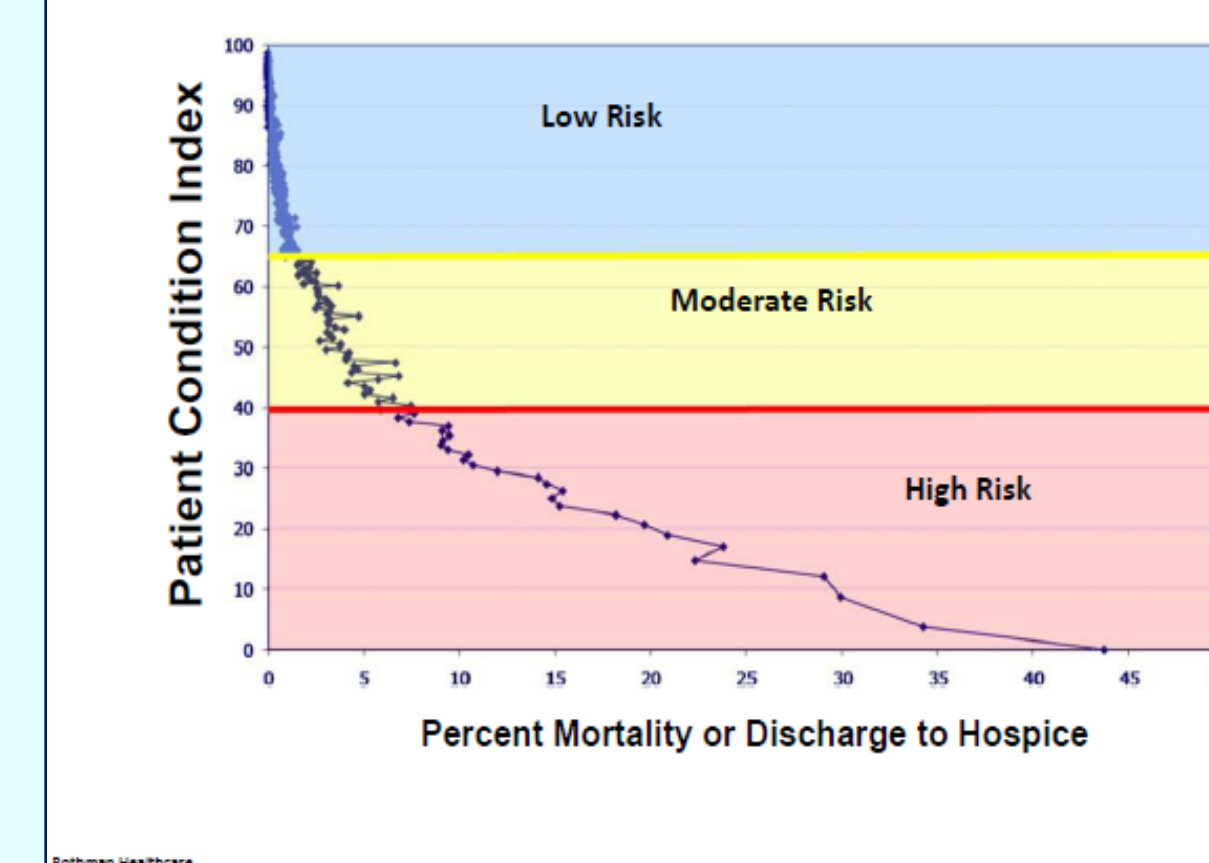
Patient risk has been shown to escalate considerably as the Rothman Index score falls. For example, there is almost no perceptible increase in risk for the patient whose score falls 10 points from 95 to 85, but there is an approximately 14% increase in risk for the patient who drops 10 points from a score of 10 to a score of 0.

For hospitalized patients discharged between October 2011 and September 2012, YNHH infection prevention staff identified central line-associated blood stream infections (CLABSI) during 113 of them (108 unique patients) for whom RI scores were also available. Patients' Earliest Rothman Index (ERI) scores were aggregated by scoring buckets with 10 point increments, with the "0" bucket containing all scores below 10 (RI scores can be negative). Percent of deaths per patient group were calculated. Logistic regression was done to determine the relationship of ERI and in-hospital death.
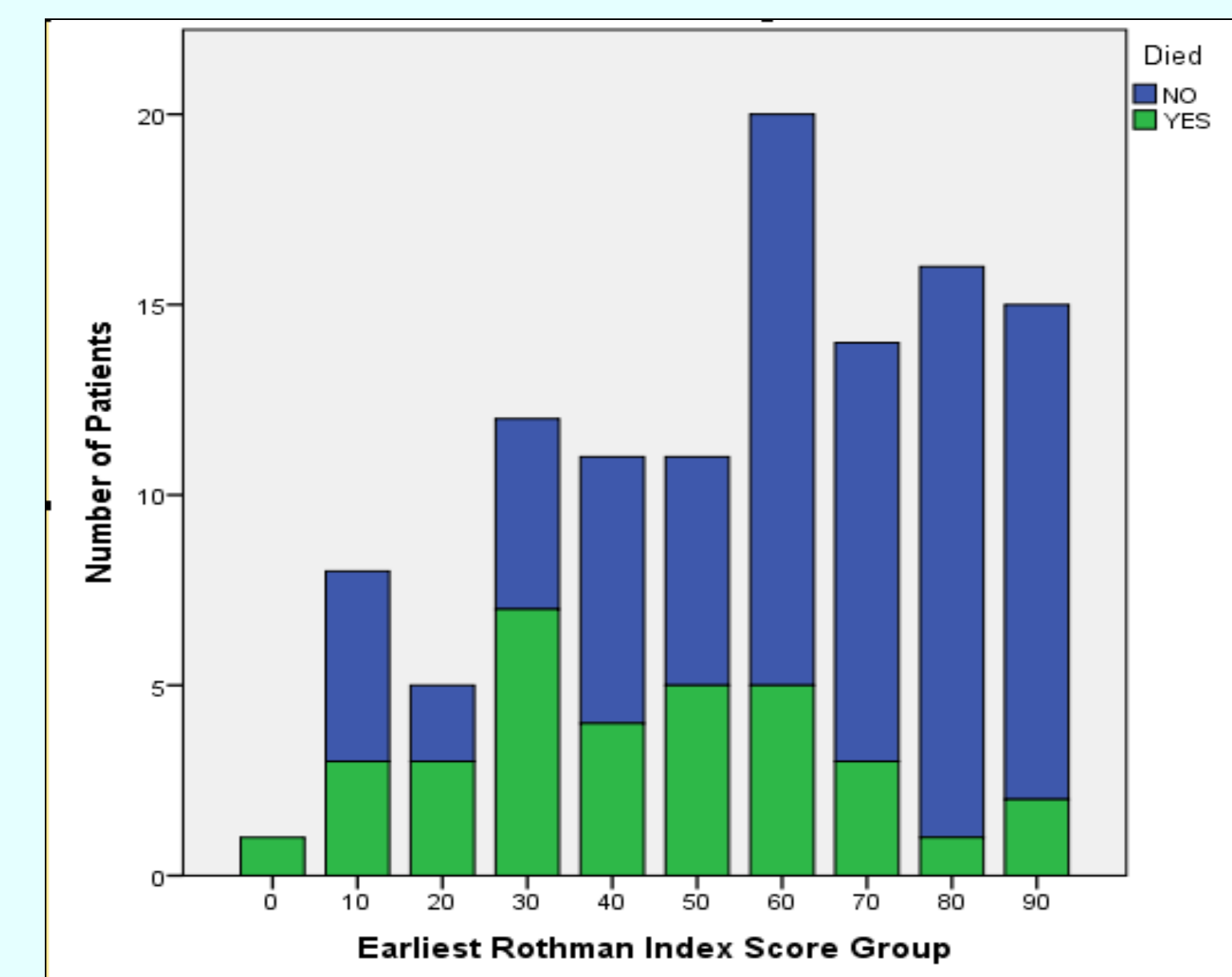
RESULTS

The logistic regression analysis of the relationship of Earliest Rothman Index (ERI) scores and death for 113 patients who developed CLABSIs indicated that *patients who were sicker, as measured by their Rothman Index score at time of admission, were more likely to die in the hospital than patients who developed CLABSIs but were in better condition when admitted* (p = 0.001).

Of the 113 patients, 62 were admitted with an RI score within the blue risk zone; their mortality rate was 15%. For those in the yellow zone (n=25), mortality was 44%, and for patients in the red zone (n=26), the mortality rate reached 54%.
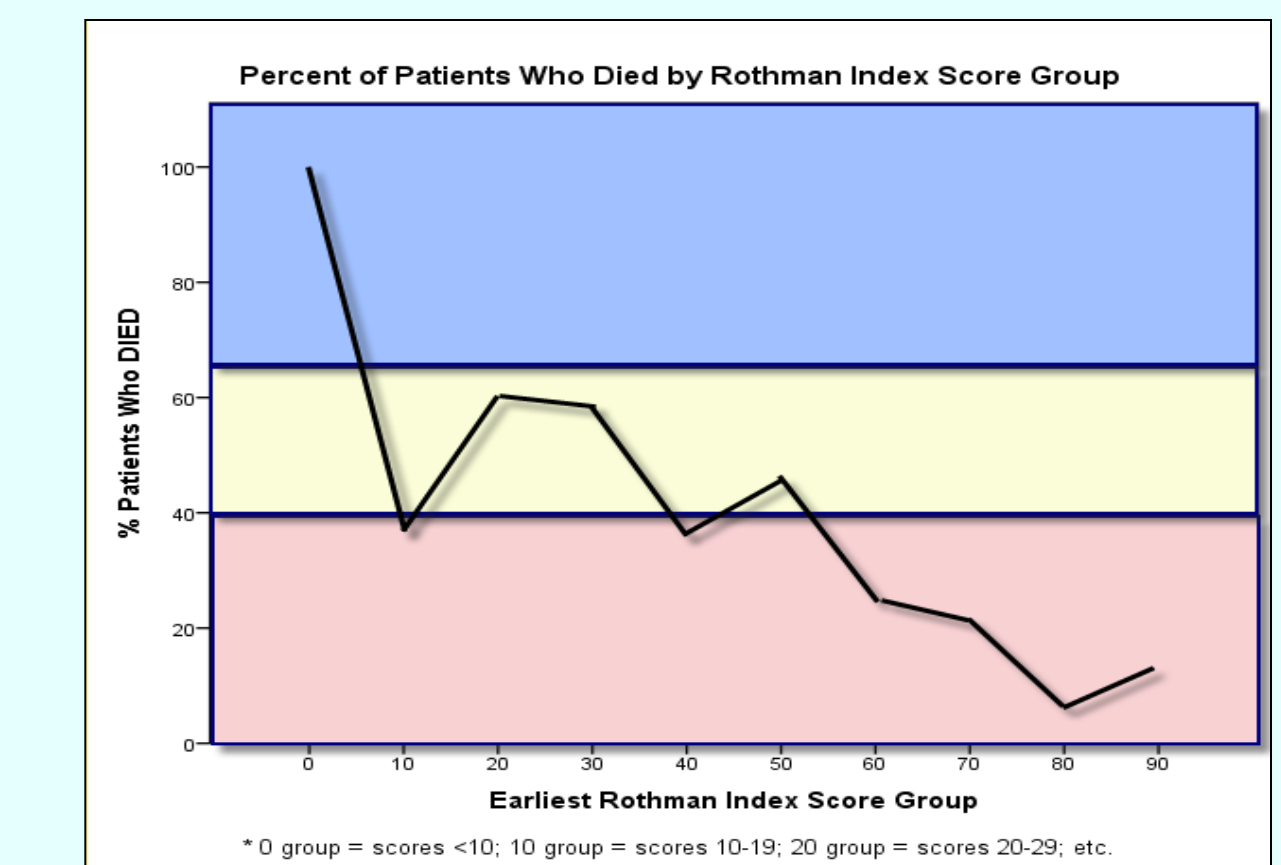
CONCLUSIONS

The Rothman Index may facilitate stratification of patients, at time of admission, into risk groups for adverse outcomes. Early recognition of increased risk coupled with initiation of preventative measures can mitigate undesired consequences and promote attainment of patient care goals.

Identifying patients at higher risk of dying if they develop a CLABSI will signal the need for increased vigilance by caregivers. The graphical display of RI scores makes subsequent and subtle changes in such patients' condition readily visible.

The Rothman Index supports critical thinking and good nursing care in today's complex environment. Because it is often difficult to see the "bigger picture" and easy to become overly task focused these days, nurses can capitalize on the RI's risk-stratification and condition-trending capabilities to ensure prompt recognition of patient deterioration. Communicating negative trends (or lack of expected positive ones) to clinical team colleagues can trigger dialogue on interventions.

Eventually, nurses' may be able to identify RI score patterns associated with, for example, developing sepsis, that spur action that prevent patient harm and promote healing.