


Applying Predictive Analytics to Support Transitions of Care

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Significance

- Timely escalation to critical care improves the chance of survival¹
- Patients in critical care who are stabilized can be transitioned to a lower level of care, freeing up essential resources
- Graphic display improves situational awareness of nurses and providers

1. Sankey, McAvoy, Siner, Barsky & Choudhry, 2018. Deterioration to door time: An exploratory analysis of delays in escalation of care for hospitalized patients. *Journal of General Internal Medicine*, 32(8): 899-900. doi: 10.1007/s11606-018-3694-x.

Learning Objectives

- Participants will be able to:
 - Describe how applying predictive analytics can support transitions of care
 - Recognize the importance of timely, accurate nursing documentation in the use of predictive analytics
 - Identify use cases for predictive analytics in their organization

How does it work?

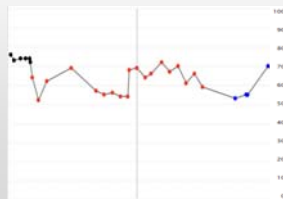
- Disease-agnostic – does not take into account the patient's diagnosis
- Evaluates 26 components (vital signs, general lab results and the nursing system assessment) to create a universal patient score.
- The lower the score, the greater the risk of mortality
- Real-time information displays in a graph, showing trends
- Drill-down into details

Background

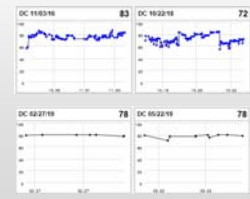
- Large community hospital (400+ beds) in urban area
- Identified an opportunity to reduce mortality
- Analyzed three cases to evaluate the predictive analytics tool
- Confirmed in all three cases, the tool would have identified patient decline earlier than current methods

Example: Patient Graphs

Graph



Historical Graphs



Example: Grid and Drill Down

Component Grid

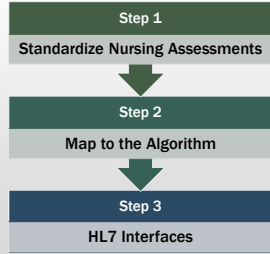
System	Score	Target	Delta
Temperature	37.2	37.2	0.0
Respiratory	17	17	0
Oxygen Sat	97	97	0
Heart Rate	75	75	0
Respiratory Rate	18	18	0
Pulse Oximetry	98	98	0
Fluid Balance	100	100	0
Abnormalities			
Diarrhea	1	1	0
Constipation	0	0	0
Fatigue	0	0	0
Dehydration	0	0	0
Overhydration	0	0	0
Malnutrition	0	0	0
Hypoglycemia	0	0	0
Hypertension	0	0	0
Hypotension	0	0	0
Hypernatremia	0	0	0
Hyponatremia	0	0	0
Hyperkalemia	0	0	0
Hypokalemia	0	0	0
Hypercalcemia	0	0	0
Hypocalcemia	0	0	0
Hyperphosphatemia	0	0	0
Hypophosphatemia	0	0	0
Hyperuricemia	0	0	0
Hypouricemia	0	0	0
Hyperbilirubinemia	0	0	0
Hypoalbuminemia	0	0	0
Hyperbilirubinemia	0	0	0
Hypoalbuminemia	0	0	0

Drill Down

Documentation for Neurological

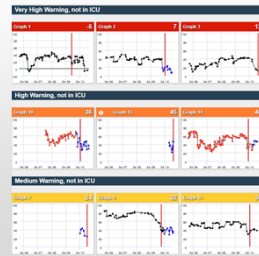
Date/Time	Value
06/11/19 12:44 EDT	Not Met
06/11/19 07:58 EDT	Not Met
	Orientation - Not oriented to time
	Orientation - Not oriented to situation
	Neurological Symptoms - Confusion
	Glasgow Coma Score - 14
	Sensory - Left - Normal
	Sensory - Right - Normal
	Neuromuscular Symptoms - None
	Characteristics of Speech - Clear
	Level of Consciousness - Alert
06/10/19 19:38 EDT	Not Met
06/10/19 20:40 EDT	Not Met
06/09/19 19:57 EDT	Not Met

Interface with the Electronic Health Record (EHR)



Warning Lanes

- Very High = Score < 20
 - Indicates high risk of mortality
- High = Score fell 50% in 12 hours
 - Indicates acute decline
- Medium = Score fell 40% in 24 hours
 - Indicates a more subtle decline



Clinical and Provider Work Groups

- Direct care and leaders from nursing and medicine collaborated to develop:
 - Work Flow
 - Communication Plan
 - Education Plan

Goals of the Project

- Reduce Mortality (overall and sepsis-related) 
- Mitigate Failure to Rescue 
- Place patients at the right level of care - ICU or IMC or Med/Surg?
- Support Transitions of Care 

Work Flow – Identifying Decline

- Staff RN Reviews Trend
 - Evidence of **RED** deterioration **(!!!!) clinical concern!**
 - **RED** Process patient per unit policy and monitor closely throughout the day
 - **RED** Identify Level (Warning Level)
 - Very High (Score < 20)
 - Assess the patient. Consider second RN verification as needed.
 - ✓ Verify documentation accuracy
 - ✓ What's changed?
 - ✓ Call/Page Provider
 - ✓ Document Provider Notification in EHR
 - Provider returns call within 5 minutes?
 - **RED** call met
 - **RED** Assess changes with Provider
 - Bedside assessment by Provider
 - **RED** initiate
 - **RED** discuss provider assessment
 - ✓ carry out orders/interventions > Proceed to #2
 - High (Score fell 50% in 12 hours) or Medium (Score fell 40% in 24 hours)
 - Assess the patient. Consider second RN verification as needed.
 - ✓ Verify documentation accuracy
 - ✓ What's changed?
 - ✓ Notify Change Nurse/RN's
 - Discuss changes with Provider and document Provider Notification in EHR > Proceed to #2
- Repeat vital signs and focused assessment within 4 hours (Medium Warning) or every 4 hours x 2 (High and Very High Warning)
- Notify Provider of change/further decline and document Provider Notification in EHR

Communication - SBAR

- Describe "what's changed" when calling the provider:
 - S: "I'm very concerned about Joe Smith, Room 4001, who has had a change in mental status. Of note, his score has dropped from 73 to 52 in the past several hours."
 - B: "Patient was admitted with CHF and shortness of breath."
 - A: "Previously, Mr. Smith was alert and oriented X4 and his vital signs and labs were stable. Now he is weak, confused and his respiratory rate has steadily increased over the past several hours. Breath sounds were clear and now they are diminished."
 - R: "Could you come and assess Mr. Smith?"

Use Cases



- Clinical Integration into Shift Report and Rounds
 - Early identification leads to early intervention



- Goals of Care Discussions
 - Family meetings
 - Palliative care referrals



- Evaluate for transitions of care
 - Stable or upward trend – consider discharge/transfer to lower level of care
 - Downward trend – consider RRT/transfer to higher level of care

Education

- Providers were educated by the physician champion
 - Received emails with attachments describing the work flow
 - Created videos accessible via smart phone
- Nurses in the pilot received information during competencies
 - Handouts describing the "who, what, when, where, how and why"
 - Work flow diagram and SBAR
- Nurses in acute care and rehab participated in one-on-one training
 - Most effective because the nurses looked at their actual patients

Results

- Mortality**
 - Mortality Rate: 2.42% (Jan 2018) to **1.86%** (June 2018)
 - Sepsis Mortality Rate: 25.49% (Jan 2018) to **16%** (June 2018)
- MRIgate Failure to Rescue**
 - Trending up in RRT calls comparing January 2018 (47) to June 2018 (65)
- Unplanned Transfer Rate**
 - 2017: 3.30%
 - 2018: 2.07% (**37% decrease**)
- Readmission Rate**
 - 2017: 16.19%
 - 2018: 9.99% (**38% decrease**)
- Average Length of Stay**
 - 2017: 6.83
 - 2018: 6.71 (**2% decrease**)

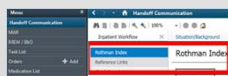
Deployment

- Placed large-screen kiosks on all Critical Care, Acute Care and Rehab units to provide visibility



- Created links in the EMR to access graphs

My Coach | Rothman Index | Clinical Leader Organizer



Opportunities

- Continue to hardwire clinical integration with nurses and providers
 - > Routine part of daily conversations
- Greater attention to patients in the medium warning lane
 - > Greatest opportunity to turn around decline, avoid RRT
- Utilize filters for palliative care consults
 - > LOS > 5 days and score <40

Thank you for your kind attention

Questions?

Contact:

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