Reliability Testing of a Modified Early Warning Scoring (MEWS) Tool
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JoAnn D. Long, RN, PhD, NEA-BC
Objectives

- The learner will be able to discuss the reliability testing of an adapted evidence-based Modified Early Warning Scoring (MEWS) tool.
- The learner will be able to discuss Modified Early Warning Scoring (MEWS) tool reliability testing results with implication to nursing practice.
Covenant Health
Lubbock, Texas, U.S.A.

- 1,006 licensed beds
- 5000+ employees
- 600 staff
- Physicians
- Average daily census of 500
- Largest health care institution in the West Texas and Eastern New Mexico region
- Serves 62 counties and over 1.2 million people
Purpose Behind MEWS

- Answering a call to action from:
  - Institute for Healthcare Improvement (IHI)
  - Agency for Healthcare Research and Quality (ARHQ)
- Clinical signs of deterioration appear hours before life-threatening event occurs
- Key indicators for deterioration are being missed
Background

- Failure to recognize deterioration may lead to adverse events such as cardiac arrest
- Subtle changes may go undetected contributing to an estimated 98,000 annual preventable deaths in the USA alone.
- Previous research has shown Early Warning Scoring Systems (EWSS) identify patients at risk for deterioration
Background

- Covenant Health, Lubbock, Texas, USA
  - No process to screen patients “at risk” for deterioration or sepsis
    - Patients diagnosed with severe sepsis face a 29-50% mortality rate (Seymour et al., 2010)
  - Covenant Health committed to finding process solutions for earlier detection and treatment of any “at-risk” deteriorating patient
Pilot Study Aim

- To structure a process identifying deteriorating and/or septic patients through a defined algorithm before life-threatening events occur.
- To identify the “at-risk” patient prior to rapid response team (RRT) activation in a life-threatening situation.
Research Design

**Phase 1: Preliminary MEWS Tool Conceptualization (March 2012-July 2012)**

- Preliminary literature review

- Shared Governance teams’ development of a preliminary process to identify at-risk for deteriorating patients

- Primary tool created for measurement of physiological findings with an inclusive algorithm guiding result-based actions
Research Design

**Phase 2: MEWS Literature Review (July 2012)**

- Developed PICOT (Population, Intervention, Comparison/Control, Outcome you seek, Time frame)
- Identified gaps in current evidence and PICOT question being asked
- Validated MEWS tool physiologic measurement components
- Validated patient population selected for use
# Modified Early Warning Score (MEWS)

MEWS is designed to identify patient deterioration and ensure early intervention. Use clinical judgement too.

<table>
<thead>
<tr>
<th>TEMP (°F)</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
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</thead>
<tbody>
<tr>
<td>≤ 95.0</td>
<td>≤ 95.1-96.8</td>
<td>≤ 96.9-100.4</td>
<td>100.5-101.4</td>
<td>≥ 101.5</td>
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<tr>
<td>Systolic BP</td>
<td>≤ 70</td>
<td>71-80</td>
<td>81-100</td>
<td>101-159</td>
<td>160-199</td>
<td>≥ 200</td>
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<tr>
<td>Beats/min</td>
<td>≤ 39</td>
<td>40-50</td>
<td>51-89</td>
<td>90-110</td>
<td>111-129</td>
<td>≥ 130</td>
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<tr>
<td>Breath/min</td>
<td>≤ 7</td>
<td>8-11</td>
<td>12-20</td>
<td>21-23</td>
<td>24-29</td>
<td>≥ 30</td>
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<tr>
<td>O² Therapy</td>
<td>≤ 3 L/min</td>
<td>≤ 4 L/min</td>
<td>4.5 L/min</td>
<td>50% VM</td>
<td>100% NRB or BiPAP</td>
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<tr>
<td>LOC</td>
<td>Unresponsive</td>
<td>Responds to pain</td>
<td>Responds to voice</td>
<td>Alert</td>
<td>Agitation or irritability</td>
<td>Confusion</td>
<td>Delirious</td>
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<tr>
<td>WBC</td>
<td>Lactate &gt; 4 = RRT Call</td>
<td>&lt; 4,000</td>
<td>4,000-12,000</td>
<td>&gt; 12,000</td>
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<tr>
<td>Urine Output</td>
<td>&lt; 30 ml/hr</td>
<td>&gt; 30 ml/hr or Patient on dialysis</td>
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**Shift**

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**Date**

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**Time**

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**Initials**

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**Temp (°F)**

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**Systolic BP**

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**Beats/min**

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**Breath/min**

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**O² Therapy**

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**LOC**

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**Lab Results**

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**WBC**

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**Lactate**

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**WBC Score**

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**Urine Output**

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**Total Score**

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**Color (G,Y,O,R)**

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**Algorithm Followed (✓)**

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G = Green, Y = Yellow, O = Orange, R = Red
Research Design

Phase 3: MEWS Tool Pilot (July 2012-Present)

- Began to Pilot the MEWS tool
- MEWS tool design changes and revisions made based on user feedback with PDCA (plan-do-check-act) cycle of change
Research Design

Phase 4.1: MEWS Tool Reliability Testing (October 2012)

- Reliability tested using simulation to minimize variables
- MEWS tool design changes and revisions made based on testing results using PDCA (plan-do-check-act) cycle of change
Testing And Tweaking Of Tool

The tool was designed to be used easily at the bedside with limited training.

After initial testing the tool was changed to include the capability to tally the MEWS result.

Just when we thought the tool was perfect the test subjects would show us it wasn’t!
Reliability Testing Components

Pre Testing
- Holding Area
- Qualification and Confidentiality Statement

Testing
- Scripted Education Scenario
- 4 Scenarios completed with no help from researchers

Debrief
- Quiet, Private Room
- Qualitative data gathering
Reliability Testing

- As little human interaction as possible
  - Prevent bias
  - Ensure standardization
  - Provided reproducibility

- All information needed was provided in the simulation
  - Vital Signs
  - Urinary output
  - Labs (Lactate and WBCs)
  - Level of Consciousness (in writing)
  - Oxygen Therapy
    - Real Sepsis patient data was used in all simulated experiences
Reliability Testing Using Simulation

- A convenience sample of 25 nurses was used from 12 different units that would be using the tool.
- Participants were disqualified if they possessed any prior knowledge of MEWS.
- Four scenarios were developed using low-fidelity mock hospital simulation: One to test each color on the MEWS tool.
  - Randomization among color order
Guttman Split-Half Coefficient .868

**Green Scenario:**
- Assessment findings scored “0”
- Lactate was high to test notification of RRT

**Yellow Scenario:**
- Low urine output
- High respiratory rate
- Elevated WBC’s

**Orange Scenario:**
- High heart rate
- High respiratory rate
- Low WBC’s

**Red Scenario:**
- Low temp
- Low BP
- High respiratory rate
- High heart rate
- Oxygen delivery via Venturi Mask
Reliability Participant Comments

“At first, upon learning I was slightly confused on where the numbers went, but once in a scenario it all made sense.”

“Numerous scenarios allowed me to become more comfortable with it's use.”

“I like how well controlled the experiment was. It will be interesting to see the results.”

100% of the subjects reported simulation was an effective method for clinical testing of the tool
Lessons Learned

Don’t be too eager to get your tool out
- Test your tool first
- Reveals flaws and allows for correction

Simulation is an effective way to:
- Test a clinical tool
- Gain stakeholder buy-in
- Received better acceptance from the test participants than on the pilot units.

Nursing Research is do-able!
- Dependent on a committed, passionate team with strong leadership

Our Tool is reliable and is ready to be implemented in patient care
Questions for the Presenter?

Lexie Scarborough Futrell, MSN, RN, CCRN

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