Usability & Acceptability Testing of a Modified Early Warning Scoring (MEWS) Tool Using Simulation

Jamie Roney, Erin Whitley, Jessica Maples, Lexie Futrell, Kimberley Stunkard, & JoAnn Long
Identifying at-risk patients prior to rapid response team activation & often missed sepsis patients led to assessment tool & algorithm conceptualization combining nursing assessment findings with lab results.
Background Transforming Care at the Bedside (TCAB)

Guided by Robert Wood Johnson Foundation & Institute for Healthcare Improvement’s TCAB framework

• Subtle changes in patient condition go undetected contributing to ~35-40% of unexpected deaths occurring on medical-surgical units.
  
  (IHI, 2013)

• Primary concept: Front-line staff providing care should play role in improving care delivered.
  
  (Hassmiller & Chiverton, 2007)
PURPOSE RESEARCH QUESTION

To determine usability & acceptability of MEWS tool by healthcare providers from hospital units where tool will be implemented using simulation.
• Testing both tool & algorithm using simulation to minimize outcome variables with assessment findings from patients who died from sepsis.

• Changes to improve success of scoring accuracy & correctly following corresponding algorithms using Plan-Do-Check-Act Cycles (PDCA).
Theoretical Framework Change Model

Anticipating barriers when introducing a new form to nurses, Kurt Lewin’s action research model for change was used as a framework for this study.

(Burnes, 2004)
Kurt Lewin’s Action Research Model for Change

Unfreeze
Ensures employees are ready for change

Change
Execute intended change

Refreeze
Ensures change becomes permanent

(Burnes, 2004)
Evaluation tool designed to probe usability, attitudes towards the instrument, & use of simulation using 5-point Likert questions, verbal, & written open-ended questions used.

55 target nurses tested tool & provided feedback on tool’s usability, acceptability, fit into their workflow, & use of simulation to test the tool.
Methodology Testing Using Simulation

• Low-fidelity simulation selected for use in testing usability & acceptability called Mock Hospital used. (Morris & Faulk, 2012)

• Mannequins represented hospitalized patients in 4 simulated hospital rooms with 4 charts – matched number of scenarios being tested.

• Realistic clinical situations encountered in practice using actual septic patient data allowed for focus on cognitive & psychological simulation fidelity.
Methodology Data Collection

Feedback loop

• Closure through reflection on the experience using survey

• Evaluated using structured, scripted debriefing

• Surveyed individually in a comfortable place independent of distraction.
Research Population Demographic Data

• Gender (N = 25)
  • Female 100% (25)
  • Male 0% (0)

• Age Range
  • 21 y/o to 63 y/o ($\mu = 36.92$)

• Years of Nursing Experience
  • 0.5 years to 23 years ($\mu = 6.96$)

• Ethnicity
  • Caucasian 60% (15)
  • Hispanic or Latino 16% (4)
  • Black or African American 16% (4)
  • Asian 8% (2)
A variety of nursing educational levels was demonstrated by research sample population.

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSN</td>
<td>5</td>
<td>20%</td>
</tr>
<tr>
<td>BSN</td>
<td>6</td>
<td>24%</td>
</tr>
<tr>
<td>ADN</td>
<td>4</td>
<td>16%</td>
</tr>
<tr>
<td>Diploma</td>
<td>9</td>
<td>36%</td>
</tr>
<tr>
<td>LVN</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>25</td>
<td>100%</td>
</tr>
</tbody>
</table>
A variety of medical-surgical & telemetry nursing units where assessment tool will be deployed represented by research sample population

<table>
<thead>
<tr>
<th>Unit Worked</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>HC5 (Neurology Telemetry)</td>
<td>4</td>
<td>16%</td>
</tr>
<tr>
<td>S5 (Intermediate Care Unit)</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>S10 (Renal Telemetry Unit)</td>
<td>6</td>
<td>24%</td>
</tr>
<tr>
<td>S7 (Medical-Surgical Unit)</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>S9 (Medical-Surgical Unit)</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>S6 (Orthopedic Unit)</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>5N (Oncology Unit)</td>
<td>1</td>
<td>4%</td>
</tr>
<tr>
<td>W4 (Rehabilitation Unit)</td>
<td>4</td>
<td>16%</td>
</tr>
<tr>
<td>SON (RN-BSN Students)</td>
<td>4</td>
<td>16%</td>
</tr>
<tr>
<td>PM (Palliative Care Unit)</td>
<td>1</td>
<td>4%</td>
</tr>
</tbody>
</table>
Quantitative Data Collection

5-Point Likert Questions Probing MEWS Tool Usability

Question 1
- The MEWS tool is simple/easy to use. (usability)

Question 2
- I can use the MEWS tool without written instructions. (usability)

Question 3
- I can use the MEWS tool successfully every time. (usability)

Question 4
- I learned to use the MEWS tool quickly. (ease of learning)
## Usability Quantitative Research Results

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>The MEWS tool is simple/easy to use.</td>
<td>25</td>
<td>2.00</td>
<td>5.00</td>
<td>4.76</td>
<td>0.72342</td>
</tr>
<tr>
<td>I can use the MEWS tool without written instructions.</td>
<td>25</td>
<td>1.00</td>
<td>5.00</td>
<td>4.44</td>
<td>1.12101</td>
</tr>
<tr>
<td>I can use the MEWS tool successfully every time.</td>
<td>25</td>
<td>2.00</td>
<td>5.00</td>
<td>4.68</td>
<td>0.74833</td>
</tr>
<tr>
<td>I learned to use the MEWS tool quickly.</td>
<td>25</td>
<td>3.00</td>
<td>5.00</td>
<td>4.80</td>
<td>0.50000</td>
</tr>
</tbody>
</table>
I am satisfied with the MEWS tool’s purpose to identify the at-risk patients prior to clinical deterioration.

The MEWS tool is useful in identifying the at-risk patients prior to clinical deterioration.

Simulation was effective for testing a clinical assessment tool. (effectiveness of simulation)

How will the MEWS tool fit into your current workflow? (open-ended question)
### Acceptability Quantitative Research Results

<table>
<thead>
<tr>
<th>Question</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am satisfied with the MEWS tool’s purpose to identify the at-risk patients prior to clinical deterioration.</td>
<td>25</td>
<td>3.00</td>
<td>5.00</td>
<td>4.80</td>
<td>0.50000</td>
</tr>
<tr>
<td>The MEWS tool is useful in identifying the at-risk patients prior to clinical deterioration.</td>
<td>25</td>
<td>4.00</td>
<td>5.00</td>
<td>4.84</td>
<td>0.37417</td>
</tr>
<tr>
<td>Simulation was effective for testing a clinical assessment tool.</td>
<td>24</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>0.00000</td>
</tr>
</tbody>
</table>
Statistical Analysis of Quantitative Data

• Cronbach’s Alpha (coefficient alpha) internal consistency of Likert scale used to test internal consistency of MEWS satisfaction scale.
  
  (Melnyk & Fineout-Overhold, 2011)

• Likert-type questions data were entered into SPSS version 13.

• A Cronbach’s Alpha of 0.83 was determined for the six item MEWS satisfaction scale in this sample.
Qualitative Research Results
Question 1 How will this tool fit into your current work flow?

Coding Qualitative Data

• Grouped/coded data around three major themes
• No outliers for developed framework were identified
• All comments (N=17) were entered into one unique category
  1. Acceptability to fit into work flow
  2. Utility for catching deteriorating patients
  3. Believability in tool to identify target patient population

*All comments (N=17) reported
**Question 1** How will this tool fit into your current work flow?

**Acceptability for fit into work flow responses (N = 5)**

- “I believe it will work well.”
- “Well fit, a part of my charting routine”
- “Easily”
- “Would fit”
- “This is exciting to use every 4 hour assessments with vital signs.”
**Question 1 How will this tool fit into your current work flow?**

**Utility for catching deteriorating patients (N = 5)**

“Monitoring patients when questionable or unsure, gives a set of algorithms to follow”

“Is a simple composite grid, a description of patient status, easily obtained with a large patient workload”

“Guide and simple and provided a snapshot of patient's current status.”

“Will be good tool to use to monitor patients status and knowing when to notify physicians.”

“With the variety of patients on the floor, it will be beneficial for me to acknowledge the difference between patients and their condition.”
Question 1 How will this tool fit into your current work flow?

Believability in tool to identify target patient population (N = 7)

“Can help determine who is at risk”
“Can help determine who is at risk”
“It will help me to quickly identify deteriorating patients.”
“It will guide me to the proper way.”
“Seems helpful in "catching" people before they deteriorate.”
“Identifying high risk patients to transfer to high level of care.”
“Identifying high risk patients to transfer to high level of care.”
“Might increase the ability to see patients in need earlier”
“It will add to more paperwork, but the guide would be helpful of at risk patients.”
“Might increase the ability to see patients in need earlier”
Question 2 Describe how simulation impacted your research experience today.

Coding Qualitative Data

• Grouped/coded data around 2 major themes
• 3 outliers for developed framework were identified
• Comments (N=17), except for outliers (N=3), were entered into one unique category
  1. Facilitated testing of clinical tool (N= 13)
  2. Beneficial to overall research experience (N = 4)
Assessment of How Simulation Impacted Research Experience

Repeating Idea
- Liked
- Made sense
- Beneficial
- Helpful

Theme
Simulation facilitated testing of clinical tool & enhanced overall research experience

Conclusion
Simulation positively impacted research experience in this sample
Validity of MEWS Research

• Content validity of MEWS tool evaluated through systematic evaluation of MEWS literature.

• MEWS tool evaluated with existing published scoring tools.

• Unique changes made to MEWS tool:
  * Adding missing sepsis screening criteria,
  * Adjusted to match Systemic Inflammatory Response Syndrome (SIRS) parameters, &
  * Replaced oxygen saturation measurements with oxygen delivery device for scoring.
**Conclusion**

Simulation was successfully used to test both usability & acceptability of a clinical screening tool for identifying the at-risk for deteriorating patient allowing for planning & variable control.
Conclusion

This tool demonstrated usability & acceptability by this research sample. Further research is recommended in other institutions for assessment of this clinical tool.
References


References


References

Questions?

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