Reliability Testing of a Modified Early Warning Score (MEWS) System

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Introduction

Lack of international consensus on what should be included in MEWS tools. Sparse reliability & validity testing of MEWS tools exists.

Aim

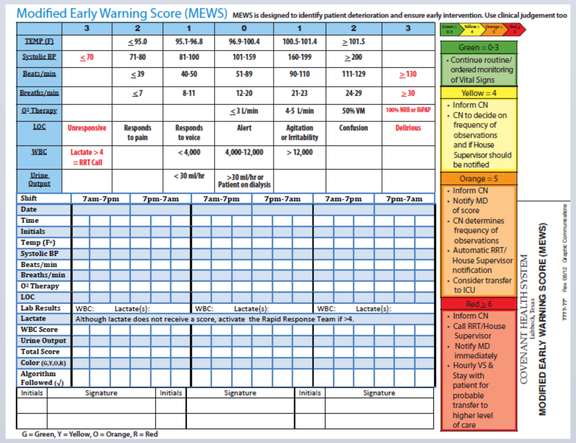
Researchers sought to report reliability testing of Covenant Health MEWS tool for use in adult medical-surgical patients.

Purpose

Purpose was to establish reliability of a MEWS tool modified for institutional use.

Background & Significance

- Patients exhibit signs of deterioration hours before cardiac or respiratory events occur.
- Vital sign & assessment findings by nurses does not necessarily translate into recognition of a deteriorating condition.
- Need exists for reliable clinical tools to quantify & stratify physiological assessment findings.
- MEWS detect & assist in recognizing subtle changes in patient conditions indicating potential clinical deterioration, thus preventing deaths.
- Tested tool created by frontline nurses.
- Adapted to include all Systemic Inflammatory Response Syndrome (SIRS) criteria.
- Modifications added to identify at- risk patients & septic patients.
- Few studies have reported reliability of MEWS tools



Modified Early Warning Score (MEWS) MEWS is designed to identify patient deterioration and ensure early intervention. Use clinical judgement too

	3	2	1	0	1	2	3
TEMP (F)		≤ 95.0	95.1-96.8	96.9-100.4	100.5-101.4	≥ 101.5	
Systolic BP	≤ 70	71-80	81-100	101-159	160-199	≥ 200	
Beats/min		≤ 39	40-50	51-89	90-110	111-129	≥ 130
Breaths/min		≤ 7	8-11	12-20	21-23	24-29	≥ 30
O² Therapy				≤ 3 L/min	4-5 L/min	50% VM	100% NRB or BiPAP
LOC	Unresponsive		Responds to pain	Responds to voice	Alert	Agitation or Irritability	Confusion	Delirious
WBC	Lactate > 4 = RRT Call		< 4,000	4,000-12,000	> 12,000		
Urine Output			< 30 ml/hr	>30 ml/hr or Patient on dialysis			

Shift	7am-7pm	7pm-7am	7am-7pm	7pm-7am	7am-7pm	7pm-7am
Date						
Time						
Initials						
Temp (F°)						
Systolic BP						
Beats/min						
Breaths/min						
O² Therapy						
LOC						
Lab Results	WBC: Lactate(s):		WBC: Lactate(s):		WBC: Lactate(s):	
Lactate	Although lactate does not receive a score, activate the Rapid Response Team if >4.					
WBC Score						
Urine Output						
Total Score						
Color (G,Y,O,R)						
Algorithm Followed (√)						
Initials	Signature		Initials	Signature	Initials	Signature

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

Green = 0-3
- Continue routine/ ordered monitoring of Vital Signs

Yellow = 4
- Inform CN
- CN to decide on frequency of observations and if House Supervisor should be notified

Orange = 5
- Inform CN
- Notify MD of score
- CN determines frequency of observations
- Automatic RRT/ House Supervisor notification
- Consider transfer to ICU

Red ≥ 6
- Inform CN
- Call RRT/House Supervisor
- Notify MD immediately
- Hourly VS & Stay with patient for probable transfer to higher level of care

COVENANT HEALTH SYSTEM Lubbock, Texas 7919-FP Rev. 06/12 Graphic Communications

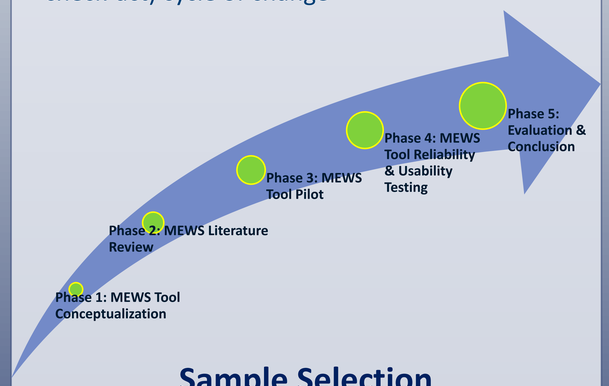
MODIFIED EARLY WARNING SCORE (MEWS)

Setting

- 977 licensed beds
- 5000+ employees
- Largest health care institution in the West Texas & Eastern New Mexico region
- Serves a 62 county area

Research Design

- Reliability & usability 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



Sample Selection

- Convenience sample (n=30) of nurses working acute care units not currently using the tool were recruited.
- Participants were disqualified if they possessed any prior knowledge of MEWS

Methodology

- Test-retest used to evaluate reliability MEWS tool
- Four scenarios were developed using low-fidelity mock hospital simulation
- One scenario tested each color on MEWS tool
- Real data from hospitalized sepsis used

As little human interaction as possible for:

- Prevention of bias
- Ensured standardization
- Allowed for reproducibility

All information needed was provided including:

- Vital signs
- Urine output measurement
- Laboratory values
- Level of Consciousness
- Oxygen Therapy Amount

Screening
- Qualification vetted in holding area
- Mitigated influence from other participants
- Confidentiality statement signed by participants

Testing
- Scripted education scenario used
- Subjects initially guided through MEWS tool completion
- 4 scenarios completed in set order with no assistance from researchers

Retesting
- Approximately 3 weeks elapsed for T2 testing
- Scripted materials used identically to T1 testing
- Same four scenarios for retesting used
- T2 scenarios completed in identical order to T1

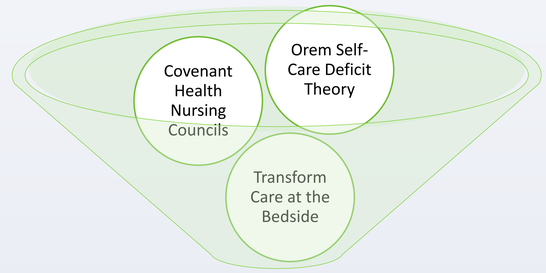
Conceptual Framework

Transforming Care at the Bedside (TCAB)

Guided by TCAB framework

- Primary concept: Front-line staff providing care should play role in improving care delivered (Institute for Healthcare Improvement [IHI], 2013)
- Aim to reduce codes on medical/surgical units

Early detection & response systems designed using shared governance approach



Shared Governance Model

High quality, safe patient-centered care

Results

T1 & T2 paired scores were analyzed using Pearson's *r* correlation to establish reliability of MEWS tool

- Data entered into *SPSS* version 22
- Statistical consultation obtained
- Pearson *r* Correlation coefficient calculated for "Total" scores for each participant in each scenario
- Green r=0.48, Yellow r=0.76, Red r=0.64, Orange r=0.61 (composite reliability of 0.62)
- Variable in Green scenario influenced accurate participant scoring of Green scenario using tool
- Suggests acceptable composite reliability
- Significant difference of 0.5 found between T1 & T2 among participants who indicated they "could use the MEWS tool without written instructions" $\underline{t}$ (19) = 2.77, p = 0.012

Conclusion

IHI suggests MEWS systems can save lives. Few studies have reported reliability of MEWS tools. Results of this small study suggest acceptable composite reliability of the Covenant Health MEWS tool with significant usability amongst nurses, thus providing a foundation for future research.

References

Institute for Healthcare Improvement (2012). *Transforming Care at the Bedside*. Retrieved from http://www.ihi.org/Engage/Initiatives/Completed/TCAB/Pages/default.aspx