Modified Early Warning Score (MEWS) in the Electronic Health Record (EHR)

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Introduction

- Despite a formal and high functioning Rapid Response Team (RRT) practice at Geisinger:
  - Anecdotal review of 2009-2010 RRT's concluded that there were delays in identifying patient deterioration
  - A majority of 2010 RRT patients displayed a decline in physiologic parameters 4-12 hours prior to the RRT
  - Increased RRT calls can develop from incorrect patient placement, especially in hospitals with high census peaks. (1)
- Modified Early Warning Score (MEWS) is linked to
  - Transfer to the ICU
  - Mortality
  - Cardiac Arrest (2,3,4)

Project Goals

- Implementation of MEWS protocols and standard of care
  - Use real-time automatic calculation of MEWS in the EHR from existing vital sign documentation- NO HAND CALCULATION
  - Display MEWS real-time in the EHR
    - No delays in communication
  - Provide IT decision support in the EHR that facilitates MEWS protocols
  - Create automated reporting of process metrics
    - Use information from the Geisinger data warehouse
    - No chart reviews to review process metrics
    - Timely feedback to nursing units on current status
- Outcomes to be measured
  - Length of stay
  - Mortality outside the ICU
  - Transfers to the ICU
  - Unsafe transfers to the ICU
  - Codes outside the ICU

Implementation Team

- Chairperson: Code and RRT committee
- Nursing: nurse educators, staff nurses, managers, IT Director of Optimization
- Providers: Clinical Innovation IT Director
- Clinical Innovation: Intermediate analyst
- IT: Inpatient EHR build analysts

MEWS Calculation and Algorithm

	3	2	1	0	1	2	3	4
Temp		< 35.1		35.1–38.4		> 38.4		
HR		< 40	40-50	51-100	101-110	111-129	>129	
SBP	<71	71-80	81-100	101-199	> 199			
Resp		< 9	9	10-18	19-20	21-29	> 29	
Coma				15	13-14	10-12	6-9	0-4

MEWS Score	Nursing Action
0-2	Routine Monitoring
3	Increased nursing surveillance, Q1 and Q2 hrs.
4	Increased nursing surveillance, provider to bedside
5 and above	RRT, notify provider stat

Workflow at a Glance

Normal MEWS

Enter vital signs in EHR → Automatic MEWS Calculation → Routine patient monitoring

Elevated MEWS

Enter vital signs in EHR → Automatic MEWS Calculation → MEWS 3: Q1 vitalsx2, then Q2

MEWS 3: Q1 vitalsx2, then Q2 → Evaluate MEWS Q2

MEWS 3: Q1 vitalsx2, then Q2 → MEWS 4 → provider evaluation. MEWS 5 → RRT

Nursing Protocol for Elevated MEWS

MEWS 3
1. Retake vital signs to corroborate score
2. Notify RN
3. Continue vital signs Q1 x2, then Q2
4. O2 sat 90-92%→ Oxygen 2 liters via nasal prongs
5. O2 sat < 90%→ non-rebreather mask
6. IV access
7. Hourly urine output measurement
8. Notify provider if MEWS3 for > 2 hours
9. MEWS evaluation Q2

MEWS 4
1. Steps 1-7 of MEWS 3
2. Notify provider to evaluate patient
3. MEWS evaluation Q2

MEWS 5
1. Retake vital signs to corroborate score
2. Activate Rapid Response Team

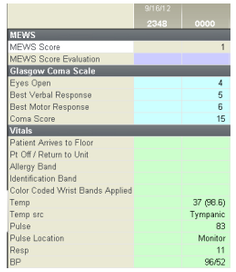
Training Approach

Nursing
1. Nursing educators were responsible for unit based training
2. The MEWS Team provided written materials and workflows
3. Each unit was provided analysis of their current volumes of elevated MEWS
   - This helped allay nurses fears of a LOT more work
4. The MEWS Team rounded on each patient unit during implementation
5. The EHR allowed for easy identification of elevated MEWS patients
6. Patient units were given biweekly process metric feedback on their CURRENT patients with elevated MEWS

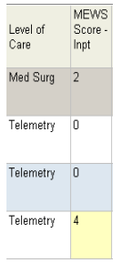
Provider
1. Presentation at hospitalist and surgical staff meetings
2. Electronic Fast Facts to all providers
3. Immediate follow up by MEWS team of communication issues

Real-time Display in the Electronic Health Record

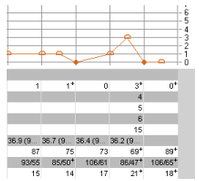
Flow Sheet



Patient List

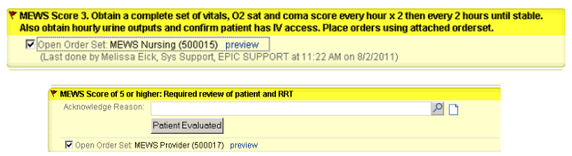


Graphical Summary



Patient Banner

EHR Decision Support



Real Time Display on the Nursing Dashboard

Patient Status

Metric Name	Status	Pts
Forgets Limitations - High Fall Risk		5
Falls - Current 24 Hrs		0
Falls - Previous 24-48 Hrs		0
Pain Score >= 4		5
Skin Breakdown		3
Foley > 48 Hours		4
Mews Score of 3		3
Mews Score of 4		2
Mews Score >= 5		1
# Patients on Floor		25

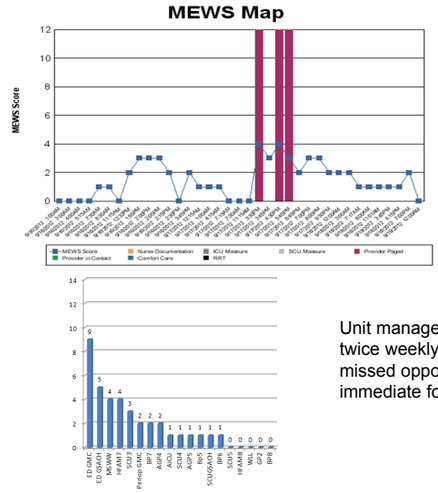
Evaluation

Process Metrics--Leadership was provided twice weekly reports of patients currently in the hospital and how nurses and providers were following the MEWS policy

Nursing Process Metrics
1. Increased vital sign frequency with elevated MEWS
2. Documentation of evaluation of elevated MEWS

Provider Process Metrics
1. Evaluation of the patient with MEWS 4 or higher

Process reviews were completed using EHR data in our clinical data warehouse→ NO CHART REVIEWS WERE NECESSARY



Unit managers received twice weekly reports of missed opportunities for immediate follow up

Outcomes

1. Successful implementation of real time automated MEWS calculation and implementation of standards incorporated in daily EHR workflows is possible, as evidenced by > 90% nursing process compliance by month 3.
2. Implementation of MEWS within the EHR allowed for timely and automated process review.
3. Consistent results following MEWS implementation:
   - Codes outside of the ICU→ Decreasing
   - Unsafe transfers to the ICU→
     - Decrease in unsafe transfers to the ICU with MEWS
     - Elevated MEWS increases the likelihood of an unsafe transfer to the ICU
4. Inconsistent results following MEWS implementation:
   - Mortality outside of the ICU→ One hospital increased and one hospital decreased.
   - Transfers to the ICU → One hospital increased and one hospital decreased.
   - Length of stay → One hospital increased and one hospital decreased

REFERENCES

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2. IHI: Early Warning Systems: Scorecards that save lives. www.ihi.org/ihi/topics/criticalcare/intensivecare/improvementstories/FSEarlyWarningSystemsScorecardsThatSaveLives.htm
3. Subbe C.P. et al.: Validation of a Modified Early Warning Score in Medical Admissions. QJM 94:521-526, Oct 2001
4. Carle C., et.al. : Use of a Modified Early Warning System to Predict Outcome in Patients Admitted to a High Dependency Unit. Critical Care 2007, vol 11