Recipe for Early Recognition:
Monitor Early Warning System
MEWS

• Bellin Health
  • Presented by:
    • Cheryle Schultz MSN APNP CCNS
  • Critical Care Clinical Nurse Specialist
Disclosures

• I have no conflicts of Interest
• I am not being sponsored by any commercial support other than the American Nurses Association
• I am not endorsed during my presentation by any product affiliation
Objectives

• Identify how data entered in the EMR can develop a recipe for an early warning tool identifying patient condition changes in real time.

• Develop key ingredients to design the MEWS to be automated and real time.

• Analyze the MEWS tool prevention data to provide decreasing code blues events throughout the inpatient stay.

• Analyze the MEWS tool to effectively reduce sepsis mortality measures over a six month period.
Clinical Nurse Specialist as change artist in EMR Implementation

1. Credentialed Trainer of Physician Order Management (CPOM)
2. Zone Lead of Critical Care
3. Physician Redesign Team
4. Blazing the Trail
5. Clinical Informatics
What triggered this study?

- This year Leapfrog gave Bellin a “B” rating
- After reviewing our results we discovered:
  - Bellin has a higher risk adjusted death rate for surgical patients with “Severe Treatable” Conditions
  - We discovered that most of the patients died from severe sepsis
  - We decided to study these cases

Cascade can be insidious
What We Learned from the data?

Early recognition is a challenge

• Nursing
  • Rapid Response Team (SWAT) and Nursing Recognition
  • The time frame between 1st organ dysfunction and RRT notification was seen in 7 hours
  • Dysfunction of 3 organs occurred
  • No call was made to the Swat team on 2 patients

• Provider
  • The time frame between 1st organ dysfunction and Provider Notification was 5 hours
  • Patient deterioration could sneak up on a provider
We searched for a tool to assist in:
- Early recognition
- Communicating Objective information to physicians.

The decision support tool needed to meet the following characteristics
- Automatically pulls in discrete data
- Creates a severity of clinical illness score based on weighted discrete data
- No duplication of data entry
- Refreshes automatically
- Provides a historical view
- Alerts clinicians
- Provides direction.
What is the MEWS

- Think of it as a Recipe to early recognition of patients potential to deteriorate.
  - There are 25 clinical triggers
  - The sicker the patient the higher the number added to the mix
  - The increase in comorbidities can increase the risks of mortality and the MEWS score
  - Real time configuration with interventions visible through a changing score.
What is the Mews: Automated Data Points

How it works...RISK SCORING

All the results (data) have points associated with each value and the values are totaled to produce a risk score.
Low Risk for Deterioration

- Green is 0-2
- Low Risk
- Continue to monitor per floor routine.
Medium Risk for Deterioration

- Yellow is 3-5
- Medium Risk
- Continue to monitor per floor routine.
- Increase frequency of monitoring per nursing judgement.
**High Risk for Deterioration**

- RED is score >6
- HIGH RISK
- You need to do something!
  - REQUIRES documentation of interventions.
  - MEWS must be reassessed in 4 hours.
<table>
<thead>
<tr>
<th>Risk Assessment for early warning</th>
<th>No risk</th>
<th>Med risk</th>
<th>High risk</th>
<th>Extra Scoring Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Brady</td>
<td>56-110</td>
<td>50-55</td>
<td>&lt;49</td>
<td></td>
</tr>
<tr>
<td>Tachy</td>
<td>90-110</td>
<td>111-120</td>
<td>121-</td>
<td></td>
</tr>
<tr>
<td>Systolic BP Hypo hyper</td>
<td>90-154</td>
<td>85-89</td>
<td>&lt;84-</td>
<td>&lt; 84 make score 4</td>
</tr>
<tr>
<td>hypyra</td>
<td></td>
<td>155-169</td>
<td>170&gt;</td>
<td></td>
</tr>
<tr>
<td>MAP</td>
<td>65-80</td>
<td>64-55</td>
<td>&lt;54</td>
<td>6</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>14-24</td>
<td>11-13</td>
<td>&lt;10</td>
<td>Both should score 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25-30</td>
<td>&gt;31</td>
<td></td>
</tr>
<tr>
<td>Temp cool hot</td>
<td>97.4-99.9</td>
<td>96.6-97.3</td>
<td>&lt;96.5</td>
<td>&lt;96.5 score 4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>99.9-101</td>
<td>101.1&gt;</td>
<td></td>
</tr>
<tr>
<td>End Tidal</td>
<td>35-45</td>
<td>28-34</td>
<td>&lt;27</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>46-54</td>
<td>&gt;55</td>
<td></td>
</tr>
<tr>
<td>SPO2</td>
<td>92-100</td>
<td>89-91</td>
<td>&lt;88</td>
<td></td>
</tr>
<tr>
<td>O2 Device</td>
<td>Nasal cannula 2-4 liters</td>
<td>Nasal Cannula &gt;5L</td>
<td>Non rebreather, venti mask</td>
<td>Score 6</td>
</tr>
<tr>
<td>Urine Output</td>
<td>&gt;120 cc in four hours</td>
<td>100-120 in four hours</td>
<td>&lt;100 in four hours</td>
<td>Score 4</td>
</tr>
<tr>
<td>Blood Glucose</td>
<td>70-150</td>
<td>69-55</td>
<td>&lt;54</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;150-250</td>
<td>251&gt;</td>
<td></td>
</tr>
<tr>
<td>LOC</td>
<td>Alert all others</td>
<td>Lethargic, agitated, anxious, sleepy, confused</td>
<td>Obtunded, comatose, unresponsive, Combative</td>
<td>Score 6</td>
</tr>
<tr>
<td>Labs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WBC</td>
<td>3.8-10.0</td>
<td>1.5-3.8</td>
<td>&lt;1.4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11.0-16.5</td>
<td>16.6&gt;</td>
<td></td>
</tr>
<tr>
<td>Bands</td>
<td></td>
<td></td>
<td>&gt;10%</td>
<td>4</td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.5-1.5</td>
<td>1.6-2.5</td>
<td>&gt;2.5</td>
<td>4</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>0-1.8</td>
<td>1.9-2.1</td>
<td>2.2&gt;</td>
<td>4</td>
</tr>
<tr>
<td>Pit</td>
<td>150-450</td>
<td>100-149</td>
<td>&lt;100</td>
<td>4</td>
</tr>
<tr>
<td>Lactate</td>
<td>0</td>
<td>0.1-2.0</td>
<td>&gt;2.1</td>
<td>6</td>
</tr>
<tr>
<td>INR</td>
<td>0-1.9</td>
<td>2.0-3.0</td>
<td>&gt;3.1</td>
<td>4</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.8-5.2</td>
<td>3.0-3.7</td>
<td>&gt;2.9</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.3-5.7</td>
<td>&gt;5.8</td>
<td></td>
</tr>
<tr>
<td>HGB</td>
<td>&gt;9.0</td>
<td>7.9-9.0</td>
<td>&lt;7.9</td>
<td>4</td>
</tr>
<tr>
<td>Pain Score</td>
<td>0-5</td>
<td>5-8</td>
<td>&gt;8</td>
<td></td>
</tr>
<tr>
<td>RASS</td>
<td>+1, 0, -1</td>
<td>+2, 2, -3</td>
<td>+3, -3</td>
<td></td>
</tr>
<tr>
<td>Aldrete</td>
<td>8-10</td>
<td>6-7</td>
<td>&lt;5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Vital Signs

<table>
<thead>
<tr>
<th>Risk Assessment for early warning</th>
<th>No risk</th>
<th>Med risk</th>
<th>High risk</th>
<th>Extra Scoring Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Brady Tachy</td>
<td>56-110</td>
<td>50-55</td>
<td>&lt;49</td>
<td>121-&gt;</td>
</tr>
<tr>
<td>Systolic BP Hypo hyper</td>
<td>90-154</td>
<td>85-89</td>
<td>&lt;84-170&gt;</td>
<td>&lt; 84 make score 4</td>
</tr>
<tr>
<td>MAP</td>
<td>65-80</td>
<td>64-55</td>
<td>&lt;54</td>
<td>6</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>14-24</td>
<td>11-13</td>
<td>&lt;10</td>
<td>&gt;31</td>
</tr>
<tr>
<td>Temp cool hot</td>
<td>97.4-99.9</td>
<td>96.6-97.3</td>
<td>&lt;96.5</td>
<td>101.1&gt;</td>
</tr>
<tr>
<td>End Tidal</td>
<td>35-45</td>
<td>28-34</td>
<td>&lt;27</td>
<td>&gt;55</td>
</tr>
<tr>
<td>SPO2</td>
<td>92-100</td>
<td>89-91</td>
<td>&lt;88</td>
<td></td>
</tr>
</tbody>
</table>
New Vital Sign Education:

**MAP = Organ Perfusion**

Monitors will calculate the Mean Arterial Pressure based on SBP and DBP. Blood Pressure ALONE is not reliable to determine condition.

- **MAP greater than 65** = Normal organ perfusion requirements
- **MAP 64-55** = Organ not getting perfused enough.
- **MAP 54 or less** = Poor organ tissue perfusion.
  - Kidney not perfusing = decreased urine output
  - Brain not perfusing = Decreased LOC, anxiety.

\[
\text{MAP} = \frac{\text{SBP} + (2 \times \text{DBP})}{3}
\]

- MAP = mean arterial pressure
- SBP = systolic blood pressure
- DBP = diastolic blood pressure
Special Blend of Oxygen...

**Oxygen Device**

- **Green:** Nasal Cannula 2-4 liters
- **Yellow:** Nasal Cannula >5 liters
- **Red:** Non-Rebreather Mask, Venti-mask, Hi-Flow Nasal Cannula, or Ventilator
A dash of...

Urine Output

Green: >120 cc in 4 hours
Yellow: 100-120 cc in 4 hours
Red: <100 cc in 4 hours
Add a little sugar -- just the right amount!

Blood Glucose

• **Green** 70-150
• **Yellow** 55-69
  >150-250
• **Red** <54
  >251
Mix in Level of Consciousness

Green: Alert
Yellow: Lethargic
      Agitated
      Anxious
      Sleepy
      Confused
Red: Obtunded
     Comatose
     Unresponsive
### LAB RESULTS

**Pour in some lab results...**

#### Labs

<table>
<thead>
<tr>
<th>Labs</th>
<th>Normal Range</th>
<th>Low Normal Range</th>
<th>High Normal Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td>3.8-10.0</td>
<td>1.5-3.8</td>
<td>&gt;10%</td>
</tr>
<tr>
<td></td>
<td>11.0-16.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine</td>
<td>0.5-1.5</td>
<td>1.6-2.5</td>
<td>&gt;2.5</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>0-1.8</td>
<td>1.9-2.1</td>
<td>2.2&gt;</td>
</tr>
<tr>
<td>Platelet</td>
<td>150-450</td>
<td>100-149</td>
<td>&gt;100</td>
</tr>
<tr>
<td>Lactate</td>
<td>0</td>
<td>0.1-2.0</td>
<td>&gt;2.1</td>
</tr>
<tr>
<td>INR</td>
<td>0.1-1.9</td>
<td>2.0-3.0</td>
<td>&gt;3.1</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.8-5.2</td>
<td>3.0-3.7</td>
<td>&lt;2.9</td>
</tr>
<tr>
<td></td>
<td>5.3-5.7</td>
<td></td>
<td>&gt;5.8</td>
</tr>
<tr>
<td>Hemoglobin</td>
<td>&gt;9.0</td>
<td>7.9-9.0</td>
<td>&lt;7.9</td>
</tr>
</tbody>
</table>
ROLL in some Pain and Agitation...

Pain Scale
- **Green**: 0-5
- **Yellow**: 5-8
- **Red**: > 8

Sedation Scale
- **Green** +1-0-1
- **Yellow** -2 or +2
- **Red** -3 or +3 and greater
Where to find the MEWS

- Individual Nurse’s Patient list
- SWATCH list
- OVER VIEW
- STATUS Boards
# The MEWS at work on Patient List

<table>
<thead>
<tr>
<th>Room</th>
<th>MEWS Score Changed</th>
<th>Code St</th>
<th>Problem</th>
<th>Admit Date</th>
<th>Allergies Last Reviewed</th>
<th>Hendrich Score Present?</th>
<th>PTA Meds Reviewed?</th>
<th>Adv Dir</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>427</td>
<td></td>
<td>1</td>
<td>Cellulitis And Abscess Of Foot (Principal Prob)</td>
<td>5/30/14</td>
<td>05/30/14</td>
<td></td>
<td></td>
<td>Yes</td>
<td>86 year old</td>
</tr>
<tr>
<td>426</td>
<td></td>
<td>5</td>
<td>Sepsis</td>
<td>6/2/14</td>
<td>06/03/14</td>
<td></td>
<td></td>
<td>Yes</td>
<td>71 year old</td>
</tr>
<tr>
<td>264</td>
<td></td>
<td></td>
<td>Aortic Stenosis, Severe (Principal)</td>
<td>6/3/14</td>
<td>06/02/14</td>
<td></td>
<td></td>
<td>Yes</td>
<td>90 year old</td>
</tr>
</tbody>
</table>

**MEWS Score: 7** [Last reviewed: Wealth, Michael J, RN at 06/09/14 1824]

6/6 started on cefitin po ep  
6/8 recd 2uprbc for hgb 7.6  
6/9 hgb improved, plan home health or hospice

[Systolic BP: 0 points (Down 4 points since last review)] - [Last updated: 06/10/14 1423] [Add/Edit comment]  
[SPO2: 1 points] - [Last updated: 06/10/14 1423] [Add/Edit comment]  
[WBC: 1 points (Up 1 points since last review)] - [Last updated: 06/10/14 1423] [Add/Edit comment]  
[PLATELET: 0 points (Down 1 points since last review)] - [Last updated: 06/10/14 1423] [Add/Edit comment]  
[INR: 4 points (Up 3 points since last review)] - [Last updated: 06/10/14 1423] [Add/Edit comment]  
[Hemoglobin: 0 points (Down 1 points since last review)] - [Last updated: 06/10/14 1423] [Add/Edit comment]  
[WBG: 1 points (Down 3 points since last review)] - [Last updated: 06/10/14 1423] [Add/Edit comment]
Communicating the patients at high risk

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEWS Score</td>
<td>9</td>
</tr>
<tr>
<td>Action Taken</td>
<td>Continue to Monitor</td>
</tr>
<tr>
<td>SWAT Assessment</td>
<td>Follow up</td>
</tr>
<tr>
<td>SWAT Visit Reason</td>
<td>Heart rate &lt; 40, SBP &lt; 85, Uncontrolled pain, LOC change</td>
</tr>
<tr>
<td>Interventions</td>
<td>Suction, O2 per mask/nasal cannula, Place on telemetry</td>
</tr>
<tr>
<td>Outcome</td>
<td>Unplanned visit to ICU, Unplanned return to ICU, Patient transferred to OR</td>
</tr>
</tbody>
</table>
# Status Boards

Real-time view of change in patient status.

Includes only necessary information.

- Room Numbers
- Provider
- Assigned Staff
- MEWS
- Change in Score
- Code Status

*Isolation Status
*Fall Risk
*Unacknowledged Orders
*Transfer Status
*Discharge Med Rec Complete?

---

### Status Board (43 Patients)

<table>
<thead>
<tr>
<th>Location/Status</th>
<th>MD</th>
<th>Middleve Provider</th>
<th>RN</th>
<th>CNA Initials</th>
<th>Code St</th>
<th>MEWS</th>
<th>MEWS Score Change</th>
<th>Isolation Status</th>
<th>Fall Risk</th>
<th>Transfer Med Rec Status</th>
<th>Unackn Orders</th>
<th>Discharge Med Rec Complete?</th>
</tr>
</thead>
<tbody>
<tr>
<td>422-1</td>
<td>Al-Khali M</td>
<td></td>
<td></td>
<td>MELISS N</td>
<td></td>
<td>8</td>
<td>3</td>
<td>Droplet/Contact</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>423-1</td>
<td>Mortara K</td>
<td></td>
<td></td>
<td>MELISS N</td>
<td></td>
<td>3</td>
<td>1</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>424-1</td>
<td>Danowitz H</td>
<td></td>
<td></td>
<td>MELISS N</td>
<td></td>
<td>9</td>
<td>1</td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>425-1</td>
<td>Mortara K</td>
<td></td>
<td></td>
<td>HEATHL B</td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>426-1</td>
<td>Danowitz H</td>
<td></td>
<td></td>
<td>HEATHL B</td>
<td></td>
<td>3</td>
<td>7</td>
<td>Contact Transmission</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>427-1</td>
<td>Al-Khali M</td>
<td></td>
<td>TANYA J</td>
<td></td>
<td></td>
<td>9</td>
<td>1</td>
<td>Droplet Transmission</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NEURO TEAM-BMH</td>
<td>Switt, M</td>
<td></td>
<td></td>
<td>HEATHL B</td>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Scenarios

• Discharge patient with a score of 19 and Swat approach provider of potential for readmission
• Admission of 4 patients with two greater than 6 SWAT new how to prioritize the patients
• Admission on medical floor with MEWS at 20 and Nurses due diligence to care for her patient
• Earlier transfers in the ICU
• OPTIME directing patient care and staffing mix
  • GI lab ERCP
  • CSS
• Right care needs for the right expertise of the nurse
Closing GAPS

- **Epic Tools**
  - MEWS automated for SWAT March 1, 2014

- **Education Opportunities**
  - MEWS educated to all staff starting April 1, 2014

- **Goal Directed Order Sets**
  - GO live April 1, 2014
  - ASAp and Stork Go Live October 2014

- **Trial Patient Status boards**
  - OB October, 2014
  - ER November, 2014
  - ICU Feb, 2015

- **Add to OPTIME Status Boards**
  - April 2015

- **Build Historical View**
  - Go live May 9, 2015
Multidisciplinary Team

Charge Nurses
1. Admission/Transfer/Discharge:
   - Is this patient appropriate for admission to floor vs ICU?
   - Is patient appropriate for discharge?
2. Staff assignments.
   - Assign a balanced load.
   - Assign patients of high acuity to the right expertise of skills in nursing.
3. Trend

Respiratory therapy:
1. Prioritizing patient assignments
2. Managing respiratory clinical triggers increasing mews
3. Awareness of patient progressive change

PT, OT, Speech Therapies
1. Awareness of a patient condition when compiling daily schedule
2. Quick reference on patient readiness for discharge

Discharge planning team
1. Evaluate readiness for transfer out of ICU or Discharge.
2. Planning awareness of patient decline or improvement in progress
Physicians-Providers

MEWS score assists:

- **Prioritizing** patient's according to score.
- **Identify** components driving patient score (improve or decline).
- **Trending** patient score.
Data Results: Code Blue

Total Codes by Floor Before MEWS / Total Codes by Floor After MEWS

MEWS Trial with SWAT Started March

January 2013 - January 2015
Rate of Unplanned ICU Visits
9,237 Patients

MEWS Rolled Out
MEWS Historical View

Den 468 465 380 434 475 483 444 444 454 422 589 439 488 472 425 481 519 489 461 439
Pediatric (PEWS)
Maternity (MEOWS)
Preoperative Risk Tool
Discharge Readiness Tool
Acuity System
Palliative-Terminally Ill
Summary

- Pulls in discrete data automatically
- Creates a severity of illness score based on weighted discrete data
- No duplication of data entry
- Refreshes automatically
- Provides direction
- Provides a historic view
- Alerts clinicians
- EMR Clinical Program
Disclaimer: MEWS is only a TOOL

- May not trigger a SCORE in some patients who are or becoming acutely ill
  1. Health-care professionals must remember this tool will not always identify when the patient is deteriorating
  2. Use MEWS to guide best practice
  3. Must use clinical judgment in conjunction
  4. MEWS TOOL is only as good as the data entered