NATIONAL EARLY WARNING SCORES (NEWS):
A QUALITY IMPROVEMENT PROJECT

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NEWS
Background

- Research suggests that patients transferred from medical/surgical wards to intensive care units experience higher mortality rates when compared to patients admitted from emergency or operating rooms.

- Patients suffering from a cardiac and/or respiratory arrest usually exhibit physiological deviations, such as changes in vital signs and/or mental status, at least eight hours prior to their need for more intensive care.

- Several studies suggest the use of early warning scores (EWS) in different patient care settings within acute care hospitals are effective in the identification and initiation of early intervention for patients who present with or develop acute illness.

(Stenhouse, Coates, Tivey, Allsop, & Parker, 2000 & Royal College of Physicians, 2015)
Several bedside tools are available for nurses to identify patients experiencing clinical deterioration

National Early Warning Scores (NEWS) is an EWS prediction tool

NEWS focuses on a simple scoring system in which physiological measurements are assigned a predetermined score, which is then applied to a patient’s physiological measurements (vital signs)

Six simple physiological parameters form the basis of the scoring system: respiratory rate, oxygen saturation, temperature, systolic blood pressure, heart rate, and level of consciousness.

A specific NEWS value is designated to each physiological measurement and the aggregated score from all six parameters and the use of oxygen are used to predict the magnitude of variation from the norm

(Royal College of Physicians, 2015)
NEWS Background

- An initial pilot study was conducted at the project site in one medical/surgical unit to evaluate the effectiveness of the NEWS and the results of early interventions if needed.
- The outcome of interest in this NEWS pilot study was the number of Rapid Response (RRT) and Code Blue activations from the pilot unit vs. other medical/surgical units.
- The study was conducted over 26-days in one 50-bed unit (February 2014).
- 40-patients were identified who meet NEWS alert criteria.
- 14-patients were transferred to a higher level of care and 26-patients stayed in the unit with some type of bedside intervention.
- The decision was made to implement a Phase 2 NEWS study in 6 medical/surgical units.
NEWS
Comparison of 2014 Pilot Study

February 2014 RRT/Code Blue Activation with and without NEWS

Comparison Of RRT/Code Blue

- 3 East With NEWS
- 3 West W/O NEWS
- 4 East W/O NEWS
- 5 East W/O NEWS
NEWS Scoring Criteria

- Scoring Guidelines and Clinical Risk Assessment
Evidence based articles were used to examine the efficacy, specificity, sensitivity, validity and reliability of using a NEWS tool in different clinical settings. Multiple search methods were used to access the following databases:
- Cumulative Index to Nursing and Allied Health (CINAHL)
- Oxford Journals
- PubMed
- Medical Subject Heading (MeSH)
- Medline
- Cochrane Library
- Google Scholar
NEWS Framework

- Plan-Do-Study-Act (PDSA)
- Focuses on real-time changes
- Action oriented
- Developed by Best and Newhauser (2006)
- PDSA can guide a process change with measurable outcome

Early identification of clinical deterioration in patients, so that nurses and providers could initiate an immediate intervention(s) ensuring appropriate use of RRT and/or Code Blue activations and preventing further clinical decline
NEWS
Aims

1) Compare the number of RRT/Code Blue calls in six medical/surgical units before and after NEWS implementation (November/December 2014 vs. November/December 2015)

2) Explore the number of RRT/Code Blue activations based on NEWS and nursing judgment

3) Identify demographic and/or clinical factors associated with RRT/Code Blue activation
NEWS
Aims

4) Describe the characteristics of patients who were transferred to a higher level of care with patients who remained in the unit with a reportable NEWS. What was the patient’s subsequent clinical condition after receiving an intervention?

5) Describe the clinical condition(s) of patients who received a NEWS of 5 or greater or 3 in any single parameter

6) Identify the number of patients who did not receive interventions despite a NEWS scores of 5 or greater or 3 in any single parameter
NEWS
Methods

- Six adult non-monitored medical surgical units in a Level 1 trauma center in a Southern California Academic Medical Center

- **Inclusion criteria**
  - Age 18 or older
  - Hospitalized in one of the six designated pilot units
  - Any medical or surgical diagnosis

- **Exclusion criteria**
  - Under 18 years of age
  - Pregnancy
  - Repeated, unchanged NEWS
  - Receiving active palliative/comfort care
NEWS Procedures

- Conducted a pilot test of the NEWS using the Electronic Health Record (EHR)
- Pilot testing helped to identify the issues with EHR
- Approval from nursing and medical administration
- Institutional Review Board (IRB) approval from CSULB and the pilot hospital
- Developed NEWS manual documentation form
- PowerPoint presentation was developed and reviewed by the team
- In-service provided for over 500 nursing staff and 250 providers
NEWS Data Collection

- Started November 10, 2015 to December 9, 2015
- Information includes:
  - Date
  - Patient identification code
  - Demographic information (age, race, and gender)
  - Diagnosis
  - Routine vital signs and NEWS scores (every 4-hours = 6 times in a 24 hour period)
  - Level of care/intervention(s)
NEWS
Results

- Data cleaning
  - Total number of patients in the initial data set was 3,154
  - Anticipated data collection points were 113,536
  - Available data points were 102,473
  - 9.7% of the data were missing from the total data set (90.3% complete)
    - Late admission
    - Discharge
    - Off unit (procedure/surgery)
    - Refusal
NEWS
Data Distribution

Summary of Missing Data Across Six Measures by Cause, Aggregate Data from Six Time-Points ($N = 3,154$ patients)

<table>
<thead>
<tr>
<th></th>
<th>Respiratory Rate</th>
<th>Oxygen Saturation</th>
<th>Oxygen Supply</th>
<th>Temperature</th>
<th>Systolic Blood Pressure</th>
<th>Heart Rate</th>
<th>Level of Consciousness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available</td>
<td>17096 (90.3%)</td>
<td>17073 (90.2%)</td>
<td>17124 (90.5%)</td>
<td>17058 (90.1%)</td>
<td>17056 (90.1%)</td>
<td>17066 (90.2%)</td>
<td>17180 (90.8%)</td>
</tr>
<tr>
<td>Unavailable</td>
<td>1826 (9.7%)</td>
<td>1847 (9.8%)</td>
<td>1799 (9.5%)</td>
<td>1866 (9.9%)</td>
<td>1867 (9.9%)</td>
<td>1858 (9.8%)</td>
<td>1780 (9.2%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reason Unavailable</th>
<th>Missing</th>
<th>D/C (555)</th>
<th>No V/S (666)</th>
<th>*OR (888)</th>
<th>Off Unit (999)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1417 (7.5%)</td>
<td>167 (0.9%)</td>
<td>7 (0.0%)</td>
<td>12 (0.1%)</td>
<td>90 (0.5%)</td>
</tr>
<tr>
<td></td>
<td>1418 (7.5%)</td>
<td>167 (0.9%)</td>
<td>7 (0.0%)</td>
<td>12 (0.1%)</td>
<td>90 (0.5%)</td>
</tr>
<tr>
<td></td>
<td>1422 (7.5%)</td>
<td>167 (0.9%)</td>
<td>8 (0.0%)</td>
<td>12 (0.1%)</td>
<td>91 (0.5%)</td>
</tr>
<tr>
<td></td>
<td>1430 (7.6%)</td>
<td>167 (0.9%)</td>
<td>5 (0.0%)</td>
<td>12 (0.1%)</td>
<td>90 (0.5%)</td>
</tr>
<tr>
<td></td>
<td>1424 (7.5%)</td>
<td>167 (0.9%)</td>
<td>14 (0.1%)</td>
<td>12 (0.1%)</td>
<td>90 (0.5%)</td>
</tr>
<tr>
<td></td>
<td>1426 (7.5%)</td>
<td>165 (0.9%)</td>
<td>5 (0.0%)</td>
<td>12 (0.1%)</td>
<td>90 (0.5%)</td>
</tr>
<tr>
<td></td>
<td>1416 (7.5%)</td>
<td>164 (0.9%)</td>
<td>0 (0.0%)</td>
<td>11 (0.1%)</td>
<td>90 (0.5%)</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
NEWS
Comparison of RRT and Code Blue

- **Aim #1**: Comparison of RRT, and RRT/Code Blue activations before and after NEWS implementation (Pre-NEWS – Nov/Dec 2014 and NEWS Nov/Dec 2015)
Comparison of RRT and Code Blue

Results revealed that the number of RRT, and RRT/Code Blue calls decreased (per 1,000 patient days):

- November 2014/2015 = 11/5
- December 2014/2015 = 9/7

Values are not statistically significant (p => 0.05)

Clinically significant
Small numbers can affect statistical testing sensitivity
**NEWS**

**RRT/Code Blue Calls**

- **Aim #2:** RRT/Code Blue calls based on NEWS vs. nursing judgment
- Total number of RRT calls during the pilot period was 91
- 17 from the pilot unit
  - 16 RRT were activated by using NEWS (94.7%)
  - 1 alert was called because of nursing clinical judgment (5.3%)
- 2 Code Blue Activations
  - Nursing judgment (100%)
NEWS
Demographic Data

**AIM #3:** Demographic and clinical factors associated with RRT/Code Blue activations during this project period

- Total number of patients 3,154 patients
- After data cleaning selected 2,667 patients (met all 6 time points with a complete NEWS value)
- 1,611 males and 1,056 females
- Race and ethnicity
  - Hispanic 48.4%
  - Black/African American 23.4%
  - White/Caucasians 18.2%
  - Asians 9.2%
# NEWS

## Demographic Data Distribution

<table>
<thead>
<tr>
<th>NEWS Score</th>
<th>Overall</th>
<th>0-4</th>
<th>5-6 (or 3 in any parameter)</th>
<th>7+</th>
<th>(p^*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>2667</td>
<td>2634</td>
<td>32</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mean (SD)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, in years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>52.89 (15.27)</td>
<td>52.83 (15.28)</td>
<td>57.53 (14.14)</td>
<td>73.00 (n/a)</td>
<td>.08</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency (valid %)</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1611 (60.4)</td>
<td>1594 (60.5)</td>
<td>17 (53.1)</td>
<td>0 (0)</td>
<td>.40</td>
</tr>
<tr>
<td>Female</td>
<td>1056 (39.6)</td>
<td>1040 (39.5)</td>
<td>15 (46.9)</td>
<td>1 (100)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian</td>
<td>245 (9.2)</td>
<td>240 (9.1)</td>
<td>5 (15.6)</td>
<td>0 (0)</td>
<td>.05</td>
</tr>
<tr>
<td>Black/African American</td>
<td>625 (23.4)</td>
<td>618 (23.5)</td>
<td>7 (21.9)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Hawaiian/Pacific Islander</td>
<td>5 (0.2)</td>
<td>5 (0.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>1279 (48.6)</td>
<td>1279 (48.6)</td>
<td>13 (40.6)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Native American</td>
<td>6 (0.2)</td>
<td>5 (0.2)</td>
<td>1 (3.1)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>439 (16.8)</td>
<td>479 (18.2)</td>
<td>6 (18.8)</td>
<td>1 (100)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>4 (0.1)</td>
<td>4 (0.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>4 (0.1)</td>
<td>4 (0.2)</td>
<td>0 (0)</td>
<td>0 (0)</td>
<td></td>
</tr>
</tbody>
</table>

* Due to the limited sample size of NEWS Scores of 7+ formal comparisons via hypothesis testing included only the first two groups
* Presented for Independent Samples t-tests and Chi-Square tests of Independence
NEWS
Score 5-6 or 3 in Any Single Criteria

- **AIM #4:** Compare the number of patients who had a high NEWS and transferred to a higher level of care with patients with similar scores who remained on the unit
  - Total of 122 patients received a score of 5-6 or 3 in any single parameter
  - 48 patients missed interventions or were not timely identified
  - 74 patients received some type of intervention(s)
  - 63 remained in the unit after an intervention
  - 11 patients transferred to a higher level of care
NEWS
Score 7 or Greater

- 16 patients received a score of 7 or greater
- 5 patients remained in the unit
- 11 patients transferred either with NEWS score or by initiation of RRT
- 2 patients received a higher NEWS that was not reported due to unchanged NEWS (benign hypertension; COPD; asymptomatic atrial fibrillation)
- 2 patients placed on comfort/palliative care
- 1 patient with a high NEWS score was acknowledged by the provider and specific parameters written for RRT activation (Dx: s/p lobectomy; small cell lung cancer; interstitial lung disease)
## NEWS

### Intervention(s) Distribution Table

**Number of Patients Who remained in Unit After Receiving Intervention**

<table>
<thead>
<tr>
<th>Score</th>
<th>Time</th>
<th>N</th>
<th>Stayed in Unit n (valid %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>1</td>
<td>9</td>
<td>7 (77.8)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>5</td>
<td>5 (100)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>9</td>
<td>9 (100)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>5</td>
<td>4 (80.0)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>20</td>
<td>17 (85.0)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>16</td>
<td>10 (62.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Time</th>
<th>N</th>
<th>Stayed in Unit n (valid %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-6, or 3 in any single parameter</td>
<td>1</td>
<td>18</td>
<td>16 (88.9)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>11</td>
<td>10 (90.9)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>10</td>
<td>8 (80.0)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>8</td>
<td>6 (75.0)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>8</td>
<td>7 (87.5)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>19</td>
<td>16 (84.2)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Score</th>
<th>Time</th>
<th>N</th>
<th>Stayed in Unit n (valid %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7+</td>
<td>1</td>
<td>1</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>1 (50.0)</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>4</td>
<td>2 (50.0)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1</td>
<td>1 (100)</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>4</td>
<td>0 (0)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>4</td>
<td>1 (25.0)</td>
</tr>
</tbody>
</table>
NEWS
Post-Intervention Distribution

- **Efficacy of the tool**
  - The efficacy of interventions for patients who remained in the unit was analyzed using a repeated measures of ANOVA that tracked scores across 24 hours.
  - Results showed a statistically significant NEWS over time.
  - Statistically significant reductions were seen between baseline and 8-24 hours.
  - For patients who stayed in the unit with a high NEWS score, their subsequent scores decreased significantly after receiving an intervention.
NEWS
Post-Intervention Distribution

- Mean NEWS Scores at Post-Intervention Timeframes for Patients Remaining in Unit
Aim #5: Clinical condition of patients who received a high NEWS score
- Data retrieval included information about the clinical diagnosis of all patients
- Multiple comorbidities along with the admitting diagnosis made analysis inconclusive. The project investigator was unable to extract a specific diagnosis

Aim #6: Number of patients with missed intervention(s)
- 48 patients with a NEWS of 5 or greater or 3 in any single parameter experienced missed intervention
- Majority of patients missed intervention during the 0200 vital sign time period followed by the time periods of 0600, 1000, 2200
# NEWS Intervention(s) Distribution Table

## Intervention Rate by NEWS Score Category

<table>
<thead>
<tr>
<th>Score</th>
<th>Time</th>
<th>Total Sample</th>
<th>n (valid %) Intervention Employed*</th>
<th>Intervention Missed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>1</td>
<td>2634</td>
<td>9 (0.3)</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2672</td>
<td>5 (0.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>2785</td>
<td>9 (0.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>2861</td>
<td>5 (0.2)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>2980</td>
<td>20 (0.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>2990</td>
<td>16 (0.5)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5-6, or 3 in any single parameter</th>
<th>1</th>
<th>32</th>
<th>18 (56.3)</th>
<th>14 (43.8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>19</td>
<td>11 (57.9)</td>
<td>8 (42.1)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>18</td>
<td>10 (55.6)</td>
<td>8 (44.4)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>14</td>
<td>8 (57.1)</td>
<td>6 (42.9)</td>
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<tr>
<td>5</td>
<td>13</td>
<td>8 (61.5)</td>
<td>5 (38.5)</td>
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</tr>
<tr>
<td>6</td>
<td>26</td>
<td>19 (73.1)</td>
<td>7 (26.9)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7+</th>
<th>1</th>
<th>1</th>
<th>1 (100)</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>2 (100)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5</td>
<td>4 (80.0)</td>
<td>1 (20.0)</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>1</td>
<td>1 (100)</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>5</td>
<td>4 (80.0)</td>
<td>1 (20.0)</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>4</td>
<td>4 (100)</td>
<td>0</td>
</tr>
</tbody>
</table>

*
NEWS
Summary of Results

- The results did not show statistically significant differences related to the use of NEWS; nevertheless, the trend analysis is encouraging.
- Sensitivity of statistical testing can be affected with small subject numbers.
- In dealing with issues related to a patient’s clinical condition, any downward trend showing a decrease in the number of missed opportunities to intervene in situations of clinical deterioration is clinically significant for the patient, family and providers.
NEWS Discussion

- Appropriate level of admission in medical/surgical units
- 2% clinical deterioration and mortality rate
- Number of RRT, and RRT/Code Blue pre-NEWS and with NEWS
- Use of clinical judgment and high NEWS values
- Demographic data (age and race has clinical significance)
NEWS Discussion

- Delay in implementing the NEWS tool in other units after the pilot study in 2014
- Missed interventions especially at 0200
- Other reasons for missing data
- Timely documentation and acceptance of the call by the provider
- Provider and nursing education
NEWS
Limitations

- Missing data from the total data set
- Unavailability of the NEWS tool in EHR
- Provider education (Nursing 95% complete)
- Motivation to use the tool
NEWS Conclusion

- NEWS helps to identify clinical deterioration and outcome improvement
- Value in using PDSA framework, allowing real time feedback
- Scores are readily available for nurses and providers that will enhance the initiation of an intervention
- NEWS provides a realistic tool for clinical decision-making because the score includes a single physiological measure of extreme value in addition to aggregate scores that activate interventions
- Plans to implement the NEWS tool in all DHS hospitals
- Initiating pilot study in one step-down unit
Acknowledgements
References


NEWS
(National Early Warning Scores)

- Questions?