National Early Warning Score (NEWS) performance in emergency admissions to surgical specialties – comparison in “surgery” & “no surgery” subgroups

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# National Early Warning Score (NEWS)*

<table>
<thead>
<tr>
<th>PHYSIOLOGICAL PARAMETERS</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiration Rate</td>
<td>≤8</td>
<td>9 - 11</td>
<td>12 - 20</td>
<td>21 - 24</td>
<td>≥25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxygen Saturations</td>
<td>≤91</td>
<td>92 - 93</td>
<td>94 - 95</td>
<td>≥96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any Supplemental Oxygen</td>
<td>Yes</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>≤35.0</td>
<td>35.1 - 36.0</td>
<td>36.1 - 38.0</td>
<td>38.1 - 39.0</td>
<td>≥39.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic BP</td>
<td>≤90</td>
<td>91 - 100</td>
<td>101 - 110</td>
<td>111 - 219</td>
<td>≥220</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart Rate</td>
<td>≤40</td>
<td>41 - 50</td>
<td>51 - 90</td>
<td>91 - 110</td>
<td>111 - 130</td>
<td>≥131</td>
<td></td>
</tr>
<tr>
<td>Level of Consciousness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>V, P, or U</td>
<td></td>
</tr>
</tbody>
</table>

*The NEWS initiative flowed from the Royal College of Physicians’ NEWS Development and Implementation Group (NEWSDIG) report, and was jointly developed and funded in collaboration with the Royal College of Physicians, Royal College of Nursing, National Outreach Forum and NHS Training for Innovation.
Background

National Early Warning Score (NEWS)
Standardising the assessment of acute-illness severity in the NHS

Clinical paper
The ability of the National Early Warning Score (NEWS) to discriminate patients at risk of early cardiac arrest, unanticipated intensive care unit admission, and death

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e Portsmouth Hospitals NHS Trust, Portsmouth PO1 2UP, UK

Smith et al. Resuscitation 2013;84:465-470
Background

NEWS validated in 20,626 surgical admissions.

- Compared NEWS in non-elective medical and surgical patients
- Indicated similar (good) discrimination for in-hospital mortality in emergency surgical and emergency medical patients.
- Suggested that different NEWS trigger levels might be required for medical & surgical patients

Kovacs et al. BJS 2016;103:1385-1393

Comparison of the National Early Warning Score in non-elective medical and surgical patients

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Objectives

• To investigate the ability of NEWS to discriminate the risk of adverse outcome (cardiac arrest, death and unanticipated ICU admission) in patients admitted as an emergency to surgical specialties*, and to compare it in the “surgery” and “no surgery” subgroups.

* General surgery, urology, renal surgery and transplantation, colorectal, hepatobiliary and pancreatic, upper gastrointestinal, vascular, and trauma and orthopaedics.
Methods

• Emergency surgical admissions from January 2014 - December 2015

• Patients ≥ 16 years who stayed overnight or died on day of admission

• Data - electronically documented:
  ▪ Vital signs
  ▪ Patient demographics
  ▪ Operating Room/ Theatre data
  ▪ Adverse outcomes - unanticipated ICU admissions, in-hospital mortality, cardiac arrest
Methods - using RStudio

• Can connect to database via **odbc** package
• SQL Server queries can be processed in **Rmarkdown/Rnotebook** code chunks
• Pre-process data: check for NAs, NULLs etc.
• May need to recode outcome variables to 0 or 1 – instead of “dead” or ”alive” etc
• Check date formats – **strptime()** works for my data
• Reduce dataset to required variables only
• Add National Early Warning Score (NEWS)
Methods

- Primary outcome any of: in-hospital mortality, unanticipated ICU admission or cardiac arrest within 24 hours of vital signs observation
- Secondary outcome: in-hospital mortality within 24 hours of vital signs observation
- Discrimination of NEWS assessed using AUROC
## Results

<table>
<thead>
<tr>
<th></th>
<th>Surgery</th>
<th>No Surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of Admissions</td>
<td>5724</td>
<td>9839</td>
</tr>
<tr>
<td>Age years – mean (SD)</td>
<td>57.9 (22.2)</td>
<td>58.1 (21.9)</td>
</tr>
<tr>
<td>NEWS – mean (SD)</td>
<td>1.5 (1.7)</td>
<td>1.5 (1.7)</td>
</tr>
<tr>
<td>Average LoS -days</td>
<td>26.7</td>
<td>17.9</td>
</tr>
<tr>
<td>In-hospital mortality %</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Unanticipated ICU admission %</td>
<td>4.4</td>
<td>0.6</td>
</tr>
</tbody>
</table>
AUROCs

Primary outcome

No Surgery | Surgery
---|---
0.90 | 0.80

Death at 24 hours

No Surgery | Surgery
---|---
0.90 | 0.80
Results

EWS Efficiency Curve - Primary Outcome

- Non-Elec Surgical Adms - No Surgery
- Non-Elec Surgical Adms - Surgery

Activity (%) vs. Sensitivity (%)

NEWS 0, NEWS 4, NEWS 5
Conclusions

• NEWS showed good discrimination for adverse outcomes in surgical patients, irrespective of whether patients underwent surgery or not.

• Lower threshold required for same sensitivity in “surgery” patients as in “no surgery” subgroup.

• There is a difference in NEWS trigger points between “surgery” and “no surgery” for the primary outcome (but not for death within 24 hours)

• Do we need to do anything about it?
Next steps?

• Further study of data from “surgery” subgroup

• Examination of patient care pathway compare patients who go from OR/OT to ICU compared to those who return to ward & then transfer to ICU

• For ‘No Surgery’ group, what interventions did they have?
Thank you

- [http://www.chmi.port.ac.uk/](http://www.chmi.port.ac.uk/)
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- [Gary Smith](mailto:Gary Smith@port.ac.uk)
Results

EWS Efficiency Curve - Primary Outcome

- Non-Elec Surgical Adms - No Surgery
- Non-Elec Surgical Adms - Surgery
- Non-Elec Medical Adms

Activity (%) vs. Sensitivity (%)