

## Supplementary File Appendix

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

| NEWS SCORE  | FREQUENCY OF MONITORING                      | CLINICAL RESPONSE  |
|---|--|--|
| <b>0</b>  | Minimum 12 hourly                            | <ul style="list-style-type: none"> <li>Continue routine NEWS monitoring with every set of observations</li> </ul>  |
| <b>Total:<br/>1-4</b>   | Minimum 4-6 hourly                           | <ul style="list-style-type: none"> <li>Inform registered nurse who must assess the patient;</li> <li>Registered nurse to decide if increased frequency of monitoring and / or escalation of clinical care is required;</li> </ul>  |
| <b>Total:<br/>5 or more<br/><br/>or<br/><br/>3 in one<br/>parameter</b> | Increased frequency to a minimum of 1 hourly | <ul style="list-style-type: none"> <li>Registered nurse to urgently inform the medical team caring for the patient;</li> <li>Urgent assessment by a clinician with core competencies to assess acutely ill patients;</li> <li>Clinical care in an environment with monitoring facilities;</li> </ul>   |
| <b>Total:<br/>7<br/>or more</b>   | Continuous monitoring of vital signs         | <ul style="list-style-type: none"> <li>Registered nurse to <b>immediately</b> inform the medical team caring for the patient – this should be at least at Specialist Registrar level;</li> <li>Emergency assessment by a clinical team with critical care competencies, which also includes a practitioner/s with advanced airway skills;</li> <li>Consider transfer of Clinical care to a level 2 or 3 care facility, i.e. higher dependency or ITU;</li> </ul> |

Figure A1. The National Early Warning Score (NEWS) – Royal College Physicians, London, 2012©; points assigned depending on degree of abnormality of each parameter. Call-out thresholds dictate recommended frequency of monitoring & clinical response.

|   |                       |  |  |  |  |           |  |  |  |  |  |  |  |   |   |
|---|-----------------------|--|--|--|--|-----------|--|--|--|--|--|--|--|---|---|
| SpO <sub>2</sub>  | ≥96                   |  |  |  |  |           |  |  |  |  |  |  |  |   |   |
|   | 94-95                 |  |  |  |  |           |  |  |  |  |  |  |  |   | 1 |
|   | 92-93                 |  |  |  |  | NEWS      |  |  |  |  |  |  |  |   | 2 |
|   | ≤91                   |  |  |  |  |           |  |  |  |  |  |  |  |   | 3 |
| Inspired O <sub>2</sub> %   | %                     |  |  |  |  |           |  |  |  |  |  |  |  | 2 |   |
| SpO <sub>2</sub>  | ≥90                   |  |  |  |  |           |  |  |  |  |  |  |  |   |   |
|   | 88-89                 |  |  |  |  |           |  |  |  |  |  |  |  |   | 1 |
|   | 86-87                 |  |  |  |  | CREWS     |  |  |  |  |  |  |  |   | 2 |
|   | ≤85                   |  |  |  |  |           |  |  |  |  |  |  |  |   | 3 |
| Inspired O <sub>2</sub> %   | %                     |  |  |  |  |           |  |  |  |  |  |  |  | 2 |   |
| <input type="checkbox"/> Use red scale if target range is 88-92%.<br>*Adjust if using other range | ≥93 on O <sub>2</sub> |  |  |  |  |           |  |  |  |  |  |  |  |   | 2 |
|   | ≥93 on Air            |  |  |  |  |           |  |  |  |  |  |  |  |   |   |
|   | 88-92                 |  |  |  |  | SRFT NEWS |  |  |  |  |  |  |  |   |   |
|   | 86-87                 |  |  |  |  |           |  |  |  |  |  |  |  |   | 1 |
|   | 84-85                 |  |  |  |  |           |  |  |  |  |  |  |  |   | 2 |
| ≤83   |                       |  |  |  |  |           |  |  |  |  |  |  |  | 3 |   |

Figure A2 - NEWS and suggested alternative scoring systems for patients with COPD / Chronic respiratory disease. Different weightings given depending on SpO<sub>2</sub> & whether the patient was on supplemental oxygen. From top to bottom: NEWS, CREWS, Salford-NEWS. The remainder of the NEWS is unchanged. SpO<sub>2</sub> = peripheral oxygen saturation.

| <b>Died</b> | <b>No</b> | <b>Observed</b> | <b>Expected</b> |
|-------------|-----------|-----------------|-----------------|
| 1           | 1         | 0               | .923            |
| 1           | 2         | 1               | .525            |
| 1           | 3         | 1               | 4.046           |
| 1           | 4         | 2               | 1.610           |
| 1           | 5         | 3               | 4.500           |
| 1           | 6         | 4               | 5.353           |
| 1           | 7         | 5               | 5.376           |
| 1           | 8         | 6               | 2.621           |
| 1           | 9         | 20              | 17.047          |
| 0           | 10        | 66              | 66.475          |
| 0           | 11        | 68              | 67.624          |
| 0           | 12        | 85              | 84.077          |
| 0           | 13        | 95              | 93.647          |
| 0           | 14        | 105             | 105.390         |
| 0           | 15        | 110             | 112.953         |
| 0           | 16        | 111             | 109.500         |
| 0           | 17        | 120             | 123.379         |
| 0           | 18        | 140             | 136.954         |

Table A1 - Hosmer-Lemeshow test for NEWS in COPD admissions (single, first admission during study period, n=942) Chi-square 9.8, P =0.202.

| Call-out threshold |          |                   | Sensitivity       | Specificity         | PLR                 | NLR                  | PPV               | NPV               |
|--------------------|----------|-------------------|-------------------|---------------------|---------------------|----------------------|-------------------|-------------------|
| 5+                 | COPD     | NEWS              | 68%<br>(59 to 76) | 58%<br>(56 to 60)   | 1.6<br>(1.4 to 1.9) | 0.5<br>(0.4 to 0.7)  | 8%<br>(7 to 10)   | 97%<br>(96 to 98) |
|                    |          | CREWS             | 59%<br>(49 to 67) | 73%<br>(72 to 75)   | 2.2<br>(1.9 to 2.6) | 0.6<br>(0.5 to 0.70) | 11%<br>(9 to 13)  | 97%<br>(96 to 98) |
|                    |          | Salford           | 35%<br>(27 to 44) | 88%<br>(86 to 89)   | 2.9<br>(2.2 to 3.8) | 0.7<br>(0.7 to 0.8)  | 14%<br>(10 to 18) | 96%<br>(95 to 97) |
|                    | AMU NEWS | 44%<br>(42 to 47) | 88%<br>(88 to 89) | 3.8<br>(3.6 to 4.0) | 0.6<br>(0.6 to 0.7) | 17%<br>(10 to 18)    | 97%<br>(96 to 97) |                   |
| 7+                 | COPD     | NEWS              | 50%<br>(41 to 60) | 80%<br>(79 to 82)   | 2.6<br>(2.1 to 3.1) | 0.6<br>(0.4 to 0.7)  | 12%<br>(7 to 10)  | 97%<br>(96 to 98) |
|                    |          | CREWS             | 34%<br>(26 to 43) | 90%<br>(89 to 92)   | 3.6<br>(2.7 to 4.7) | 0.7<br>(0.5 to 0.7)  | 16%<br>(9 to 13)  | 96%<br>(96 to 98) |
|                    |          | Salford           | 19%<br>(12 to 27) | 97%<br>(96 to 98)   | 6.3<br>(4.1 to 9.8) | 0.8<br>(0.7 to 0.8)  | 26%<br>(10 to 18) | 96%<br>(95 to 97) |
|                    | AMU NEWS | 26%<br>(24 to 28) | 96%<br>(96 to 96) | 6.0<br>(5.5 to 6.6) | 0.8<br>(0.6 to 0.7) | 24%<br>(10 to 18)    | 96%<br>(96 to 97) |                   |

Table A2 – sensitivity, specificity, PLR, NLR, PPV, NPV at RCP suggested NEWS call-outs of  $\geq 5$  &  $\geq 7$  for all COPD exacerbation admissions (n=2,361 patients) NEWS, CREWS, Salford-NEWS & NEWS for all other AMU admissions (n=37,109 episodes). PLR = positive likelihood ratio, NLR = negative likelihood ratio, PPV = positive predictive value, NPV = negative predictive value, (95% confidence intervals). AMU = acute medical unit patients.

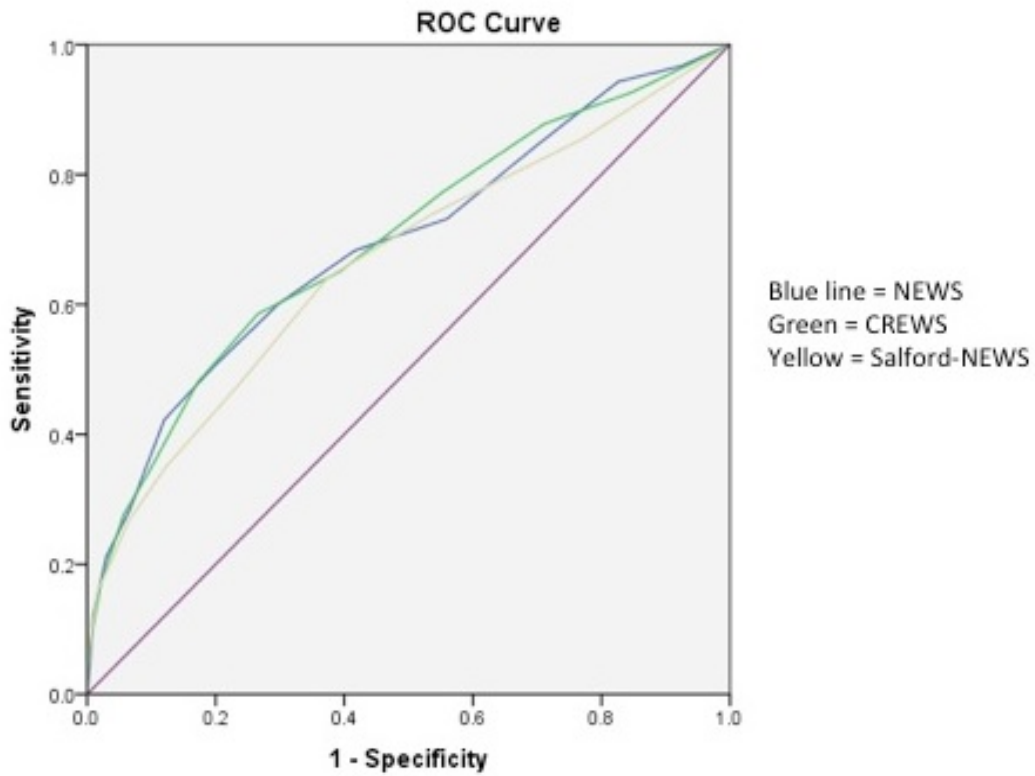
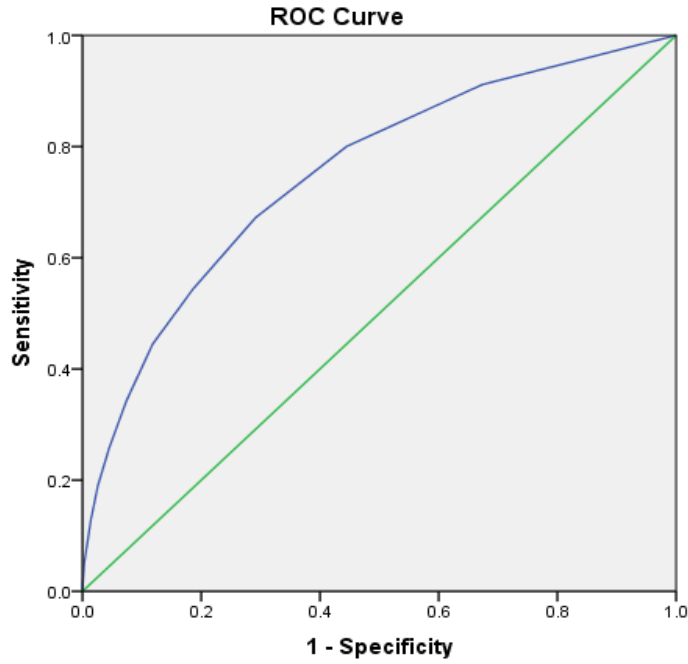


Figure A3. Area under the receiver operating characteristic curves (AUC) for three prediction scores on admission to predict in-patient mortality in patients with COPD exacerbation (all admissions, n=2,361). NEWS (blue line) AUC 0.69 (95% confidence intervals 0.64 to 0.75); CREWS (green line) 0.70 (0.64 to 0.75); Salford-NEWS (yellow line) 0.67 (0.61 to 0.72).



Diagonal segments are produced by ties.

Figure A4. Area under the receiver operating characteristic curve 0.75 (0.74 to 0.76) for NEWS (Blue line) on admission to predict in-patient mortality in the AMU cohort (all admissions, n=37,109)