National Early Warning System (NEWS)(2020)

[National Clinical Guideline No. 1]

DRAFT

March 2020

Notes:
CEU actions are marked in red.
GDG actions are highlighted in yellow and content write up is flagged in blue italics. Font style is Calibri 12 and justified.

Version History

<table>
<thead>
<tr>
<th>Date</th>
<th>Version</th>
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</tr>
</thead>
<tbody>
<tr>
<td>February 2013</td>
<td>1</td>
<td>New</td>
</tr>
<tr>
<td>August 2014</td>
<td>2</td>
<td>Sepsis guidance notes x 3 added after recommendations 8, 16 and 45</td>
</tr>
<tr>
<td>March 2020</td>
<td>3</td>
<td>Complete revision and updating of content and recommendations</td>
</tr>
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</table>
This National Clinical Guideline has been updated and revised by the National Early Warning System (NEWS) Guideline Development Group (GDG) under the auspices of the HSE National Deteriorating Patient Recognition and Response Improvement Programme (DPIP). The NCEC was requested by the Minister for Health to commission this guideline revision arising from a significant patient safety/policy matter.

**Using this National Clinical Guideline**
This National Clinical Guideline applies to adult (≥ 16 years) non-pregnant patients in acute hospitals. It does not apply to children or patients in obstetric care. This National Clinical Guideline is relevant to all healthcare professionals working in acute hospitals.

**Disclaimer**
NCEC National Clinical Guidelines do not replace professional judgment on particular cases, whereby the clinician or health professional decides that individual guideline recommendations are not appropriate in the circumstances presented by an individual patient, or whereby an individual patient declines a recommendation as a course of action in their care or treatment plan. In these circumstances the decision not to follow a recommendation should be appropriately recorded in the patient’s healthcare record.

**Users of NCEC National Clinical Guidelines** must ensure they have the current version (hardcopy, softcopy or App) by checking the relevant section in the National Patient Safety Office on the Department of Health website: http://health.gov.ie/national-patient-safety-

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**CEU Citation text**
In text citation (Department of Health 2020)
Membership of the Guideline Development Group (GDG)

The GDG was co-chaired by Dr. Miriam Bell, Project Lead, Guideline Revision, National Deteriorating Patient Recognition and Response Improvement Programme (DPIP) and Mr. Richard Walsh, Director of Nursing National Acute Medicine Programme. This National Clinical Guideline is supported by the Health Service Executive Clinical Design and Innovation; Acute Hospitals Division; ONMSD; Quality Improvement Team; Quality Assurance and Verification; and by the National Clinical Programmes for Sepsis, Acute Medicine, Surgery, Emergency Medicine, Critical Care, COPD and Paediatrics.

Membership nominations were sought from a variety of clinical and non-clinical backgrounds to ensure representativeness of all key stakeholders within the acute hospital sector. GDG members included those involved in nursing, medical and health and social care clinical practice, education, administration, research methodology, relevant national clinical programmes and three persons representing patients and the public (Table 1).

Table 1: NEWS GDG Membership

<table>
<thead>
<tr>
<th>Name</th>
<th>Job title and affiliation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miriam Bell (Co-Chair)</td>
<td>Project Lead, Guideline Revision, National Deteriorating Patient Recognition &amp; Response Improvement Programme (DPIP)</td>
</tr>
<tr>
<td>Richard Walsh (Co-Chair)</td>
<td>Director of Nursing, National Acute Medicine Programme</td>
</tr>
<tr>
<td>Avilene Casey</td>
<td>National Lead, DPIP and Area Director ONMSD</td>
</tr>
<tr>
<td>Siobhan Connors</td>
<td>Critical Care Outreach, Tallaght University Hospital, Dublin</td>
</tr>
<tr>
<td>Eileen Cotter</td>
<td>Nurse Practice Development Department, South Infirmary Victoria University Hospital, Cork</td>
</tr>
<tr>
<td>Derek Cribbin</td>
<td>Nurse Lead, National Clinical Programme Critical Care</td>
</tr>
<tr>
<td>Marina O’Connor</td>
<td>Nurse Practice Development Co-ordinator, Our lady of Lourdes’s Hospital, Drogheda</td>
</tr>
<tr>
<td>Christine Sheehan</td>
<td>Advanced Nurse Practitioner, Critical Care, Galway University Hospital</td>
</tr>
<tr>
<td>Jason Horan</td>
<td>Consultant in Emergency Medicine, Mayo University Hospital</td>
</tr>
<tr>
<td>Brendan Leen</td>
<td>Regional Librarian, HSE South</td>
</tr>
<tr>
<td>Rosemary Kratschmar</td>
<td>Patient Representative</td>
</tr>
<tr>
<td>Moira Skelly</td>
<td>Patient Representative</td>
</tr>
<tr>
<td>Damien Douglas</td>
<td>Patient Representative</td>
</tr>
<tr>
<td>AnneMarie Redmond</td>
<td>Nurse Practice Development Co-ordonator, Wexford General Hospital</td>
</tr>
<tr>
<td>Name</td>
<td>Position/Role</td>
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<td>-------------------</td>
<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Sinead Horgan</td>
<td>Group Sepsis lead, South/South West Hospital Group</td>
</tr>
<tr>
<td>Trisha Rafter</td>
<td>Resuscitation Training Officer, St. Colmcille’s Hospital, Dublin</td>
</tr>
<tr>
<td>Deirdre Staunton</td>
<td>Resuscitation Training Officer, Sligo University Hospital</td>
</tr>
<tr>
<td>Elizabeth Casey</td>
<td>Resuscitation Training Officer, Mayo General Hospital</td>
</tr>
<tr>
<td>Joe Fahy</td>
<td>Resuscitation Training Officer, NEWS, PEWS and Sepsis Nurse Lead, Ballinasloe</td>
</tr>
<tr>
<td>Anne Scahill</td>
<td>NEWS, PEWS, IMEWS and Sepsis Nurse Lead, Roscommon University Hospital</td>
</tr>
<tr>
<td>Ann Dwyer</td>
<td>Clinical Nurse Manager 2, Trauma and Orthopaedics, Tallaght University Hospital</td>
</tr>
<tr>
<td>Maura Moran</td>
<td>Senior Occupational Therapist, Acute medicine, Beaumont Hospital</td>
</tr>
<tr>
<td>Eimear Duff</td>
<td>NCHD (Intern), St. James’s University Hospital, Dublin</td>
</tr>
<tr>
<td>Lylas Aljohmani</td>
<td>Registrar, St. James’s University Hospital, Dublin</td>
</tr>
<tr>
<td>Sinead O’Neill</td>
<td>HRB-CICER</td>
</tr>
<tr>
<td>Michelle O’Neill</td>
<td>HRB-CICER</td>
</tr>
<tr>
<td>Yvonne Young</td>
<td>Group Sepsis Lead, University of Limerick Hospital Group</td>
</tr>
<tr>
<td>Peter O’Toole</td>
<td>Advanced Nurse Practitioner, NCP COPD</td>
</tr>
<tr>
<td>Emma Gorman</td>
<td>Clinical Specialist Physiotherapist – Critical Care, Mater Misericordiae Hospital, Dublin</td>
</tr>
</tbody>
</table>
(CEU) Credits

The role of the NCEC is to prioritise, quality assure and recommend clinical guidelines to the Chief Medical Officer for endorsement by the Minister for Health. It is intended through Ministerial endorsement that full implementation of the guideline will occur through the relevant service plans.

The NCEC and the Department of Health acknowledge and recognise the Chair(s) and members of the Guideline Development Group (GDG) for development of the guideline. The NCEC and Department of Health wish to express thanks and sincere gratitude to all persons contributing to this National Clinical Guideline; especially those that give of their time on a voluntary basis.

Acknowledgments <<from the Chair>> To be completed once draft finalized and ready for submission to NCEC

A full list of members of the Guideline Development Group is available in the previous page/s.

<GDG add digital signature and date >

Signed by the Chair(s) ________________________________ Date: ________________
National Clinical Guidelines

Providing standardised clinical care to patients in healthcare is challenging. This is due to a number of factors, among them diversity in environments of care and complex patient presentations. It is self-evident that safe, effective care and treatment are important in ensuring that patients get the best outcomes from their care.

The Department of Health is of the view that supporting evidence-based practice, through the clinical effectiveness framework, is a critical element of the health service to deliver safe and high quality care. The National Clinical Effectiveness Committee (NCEC) is a Ministerial committee set up in 2010 as a key recommendation of the report of the Commission on Patient Safety and Quality Assurance (2008). The establishment of the Commission was prompted by an increasing awareness of patient safety issues in general and high profile health service system failures at home and abroad.

The NCEC on behalf of the Department of Health has embarked on a quality assured National Clinical Guideline development process linked to service delivery priorities. Furthermore, implementing National Clinical Guidelines sets a standard nationally, to enable healthcare professionals to deliver safe and effective care and treatment while monitoring their individual, team and organisation’s performance.

The aim of these National Clinical Guidelines is to reduce unnecessary variations in practice and provide an evidence base for the most appropriate healthcare in particular circumstances. As a consequence of Ministerial mandate, it is expected that NCEC National Clinical Guidelines are implemented across all relevant services in the Irish healthcare setting.

The NCEC is a partnership between key stakeholders in patient safety. NCEC’s mission is to provide a framework for national endorsement of clinical guidelines and clinical audit to optimise patient and service user care. The NCEC has a remit to establish and implement processes for the prioritisation and quality assurance of clinical guidelines and clinical audit so as to recommend them to the Minister for Health to become part of a suite of National Clinical Guidelines and National Clinical Audit. The aim of the suite of National Clinical Guidelines is to provide guidance and standards for improving the quality, safety and cost-effectiveness of healthcare in Ireland. The implementation of these National Clinical Guidelines will support the provision of evidence-based and consistent care across Irish healthcare services.

NCEC Terms of Reference

1. Provide strategic leadership for the national clinical effectiveness agenda.
2. Contribute to national patient safety and quality improvement agendas.
9. Establish sub-committees for NCEC workstreams.
**Summary of changes in NCG No. 1 NEWS (2020)**

<table>
<thead>
<tr>
<th>Section</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Section 1, 2 &amp; 3</strong></td>
<td>The National Early Warning System (NEWS) now refers to an early warning <strong>system</strong> rather than an early warning <strong>score</strong> as in the original NEWS (2013). This is a major change where the focus is on ensuring a whole system response is in place to anticipate, recognize and respond to the clinically deteriorating adult patient. A whole system response involves situation awareness, a bedside track and trigger tool as an adjunct to clinician anticipation of deterioration, an escalation protocol, an appropriate tiered clinician response and over-arching governance to include after action review, audit and improvement cycles.</td>
</tr>
</tbody>
</table>

| **Section 3 Recommendations** | **Domain 1: Measurement and Documentation of Vital Signs and Other Observations**  
Recommendation 1  
Included to emphasize the role of clinical judgement in the anticipation, recognition, escalation, response and evaluation of patient deterioration.  
Recommendation 4  
‘New confusion’ added to the neurological assessment tool thus changing AVPU to ACVPU on the NEWS observation chart  
Recommendation 5  
Frequency of monitoring of observations is increased to 6 hourly from 12 hourly for first 24 hours following admission in acknowledgement of the vulnerability of patients following admission.  
Recommendation 6  
Aligned to Recommendation 1 and emphasizes the role of clinical judgement.  
Recommendation 7  
The Consultant Advisory Group (CAG) deliberated over this recommendation given the feedback received through focus groups, audit etc. As a result the decision was made not to permit parameter adjustment or NEWS score adjustment as this moves away from the evidence-based NEWS tool and effectively removes a patient from an early warning system. What MAY be altered (after the first 24 hours and only by a senior doctor) is the NEWS Escalation and Response Protocol; this enables the team to manage patients whose baseline vital signs fall outside the NEWS parameter ranges (see Recommendations 16a and 16b) |

| **Domain 2: Escalation of Care**  
Recommendation 11  
The GDG and CAG decided to allow for a brief period of delayed escalation of care by experienced nursing staff in situations where the cause of vital sign derangement is obvious and easily remedied. |

| **Domain 3: Response Systems**  
Recommendations 16a and 16b |
In acknowledgement of the vulnerability of patients in the 24 hours following admission the CAG recommended that the NEWS Escalation and Response Protocol should not be modified within the first 24 hours following admission. After 24 hours the NEWS Escalation and Response Protocol may be amended by a senior doctor and documented as a NEWS Escalation and Response Plan (see Recommendation 7).

**Recommendation 17**
The NEWS Escalation and Response Plan should be reviewed every 24 hours by a senior doctor to ensure it remains applicable and appropriate to the patient’s clinical condition.

**Recommendation 18**
Details the minimum information the NEWS Escalation and Response Plan should contain.

**Recommendation 19**
The strength of this recommendation is conditional in acknowledgment of the fact that, while some hospitals already have designated response teams, for example doctor-led or Advanced Nurse Practitioner-led response team, it will take some time for this to become standard practice across all acute hospitals.

**Recommendation 20**
As the CAG has endorsed a 3-tiered response model (supported by the international evidence) it is essential that the Executive Management Team/Board in each hospital details their hospital’s current response system and progresses towards establishing a comprehensive 3-tiered response model as recommended in NEWS (2020).

**Domain 4: Clinical Communication**

**Recommendation 25**
The CAG advocates the introduction of Safety Huddles to promote anticipatory care and situation awareness amongst staff to enable the early identification of patients who may be at risk for deterioration (see Recommendation 33).

**Recommendation 26**
While clear documentation and communication is always required following clinical review a distinction is drawn between a normal plan of care and a NEWS Escalation and Response Plan. The NEWS Escalation and Response Plan is specific to the decision to modify the NEWS Escalation and Response Protocol (see Recommendations 7, 16a and 16b).

**Domain 5: Leadership and Governance**

**Recommendation 28**
Clinical leadership at Consultant level is necessary for the sustained implementation and improvement of the NEWS; this person will require protected time to carry out this function.

**Recommendation 29**
There is natural alignment between a number of patient safety systems, for example, NEWS, PEWS, IMEWS, EMEWS, along with sepsis, cardiac arrest and clinical audit. It is recommended that where possible hospital management seeks to integrate governance of these systems.

**Domain 6: Education**
It is acknowledged that as the 3-tiered response model evolves focused education and training programmes may be required by urgent and emergency tier responders.

**Domain 7: Evaluation, Audit and Feedback**
**Recommendation 38**
It is essential that findings from NEWS and clinical outcome audits e.g. in-hospital unanticipated cardiorespiratory arrest are communicated to senior management and frontline staff and acted upon.

**Domain 8: Systems to Support High Quality Care**
**Recommendation 41**
To support frontline staff in the implementation and ongoing improvement of NEWS the move towards digital early warning systems should be progressed.
# Summary of changes in NEWS (2020)

# Glossary of terms and abbreviations

## Section 1: National Clinical Guideline recommendations

1.1 Summary of recommendations

## Section 2: Development of this National Clinical Guideline

2.1 Background

2.2 Clinical and financial impact of condition/disease/topic

2.3 Rationale for this National Clinical Guideline

2.4 Aim and objectives

2.5 Guideline scope

2.6 Conflict of interest statement

2.7 Sources of funding

2.8 Guideline methodology
   - Step 1: Formulate the key questions
   - Step 2: Search methodology
   - Step 3: Screen and appraise the evidence
   - Step 4: Develop and grade the recommendations

2.9 Consultation summary

2.10 External review

2.11 Implementation

2.12 Monitoring and audit

2.13 Plan to update this National Clinical Guideline

## Section 3: National Clinical Guideline

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<td>Domain 3</td>
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<td>Evaluation, Audit &amp; Feedback</td>
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### 3.2 Summary budget impact analysis

## Section 4: Appendices

1a Guideline Development Group terms of reference

1b DPIP Steering Group membership

1c Consultant Advisory Group (CAG) membership

1d Letter of invitation to CAG members from Chief Clinical Officer HSE
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<td>Evidence tables (sample)</td>
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<td>Economic assessment</td>
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<td>Part A: Economic evidence summary</td>
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<td>Part B: Budget impact analysis <em>(awaited from HRB-CICER)</em></td>
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<td>6</td>
<td>Detailed implementation plan <em>(under development)</em></td>
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<td>7</td>
<td>Supporting tools <em>(under development)</em></td>
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<td>8</td>
<td>Monitoring and audit</td>
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<td>Summary of Recommendations</td>
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<td>Critical appraisal instruments</td>
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<td>Summary of enablers and barriers to implementation of NEWS</td>
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<td>NEWS physiological parameters and scoring key</td>
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<td>2</td>
<td>Facilitators and barriers to escalation of care</td>
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Glossary of terms and abbreviations
Definitions within the context of this document

Clinician: A registered nursing, medical or health and social care professional

Escalation of Care: the point at which a clinician calls for a more senior clinical review - nursing or medical - of a patient

Escalation threshold: the point at which medical review of the patient is required

EWS: Early Warning System

EWSs: Early Warning Systems

Must: The use of ‘must’ indicates an absolute duty to comply with a principle. It commands the action a clinical staff member is obliged to take from which no deviation is allowed.

National Early Warning System (NEWS) a system which incorporates anticipation of deterioration, recognition, escalation, response and governance.

NEWSS: NEWS score; a track and trigger tool which is an adjunct to clinical judgement for the purpose of assisting the identification of the acutely unwell patient.

NEWS Escalation and Response Protocol: the predetermined escalation and response to NEWS triggers as outlined in the national NEWS Observations chart

NEWS Escalation and Response Plan: In some circumstances a senior doctor may decide that a patient’s baseline falls outside of the normal NEWS parameter ranges; in this instance a NEWS Escalation and Response Plan is documented which outlines the rationale for alteration of escalation and response for this patient; the timeframe in which the alteration is to be reviewed; and any additional pertinent information about further actions and/or escalation for this particular patient.

Senior nurse: A registered nurse whom the organisation deems competent in the clinical context and environment in which he/she is working.

Should: The use of ‘should’ indicates a strong recommendation to perform a particular action from which deviation in particular circumstances must be justified; clinical judgement is used.

Situation awareness (SA): ‘knowing what is going on’. SA is a system which originated in high reliability organisations such as nuclear power and commercial aviation which deal with constant and catastrophic risk yet maintain exemplary safety records.
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ACVPU</td>
<td>Alert, Confusion, Voice, Pain, Unresponsive</td>
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<td>BIA</td>
<td>Budget Impact Analysis</td>
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<td>BIU</td>
<td>Business Information Unit</td>
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<td>BP</td>
<td>Blood pressure</td>
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<td>CAG</td>
<td>Consultant Advisory Group</td>
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<td>CEO</td>
<td>Chief Executive Officer</td>
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<td>DOH</td>
<td>Department of Health</td>
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<td>EMEWS</td>
<td>Emergency Medicine Early Warning System</td>
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<td>EWS(s)</td>
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<td>High Dependency Unit</td>
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<td>HIQA</td>
<td>Health Information and Quality Authority</td>
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<td>HRB-CICER</td>
<td>Health Research Board – Collaboration in Ireland for Clinical Effectiveness Reviews</td>
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<tr>
<td>HSE</td>
<td>Health Service Executive</td>
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<tr>
<td>ICT</td>
<td>Information and Communication Technology</td>
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<tr>
<td>ICU</td>
<td>Intensive Care Unit</td>
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<tr>
<td>IMEWS</td>
<td>Irish Maternity Early Warning System</td>
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<tr>
<td>ISBAR</td>
<td>Identify, Situation, Background, Assessment, Recommendation</td>
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<tr>
<td>KPI</td>
<td>Key Performance Indicator</td>
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<td>LOS</td>
<td>Length of Stay</td>
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<td>National Clinical Effectiveness Committee</td>
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<td>National Clinical Guideline</td>
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<td>National Early Warning System</td>
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<td>NEWSss</td>
<td>National Early Warning System Score</td>
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<td>NMBI</td>
<td>Nursing and Midwifery Board of Ireland</td>
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<td>NMPDU</td>
<td>Nursing and Midwifery Planning and Development Unit</td>
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<td>NSP</td>
<td>National Service Plan</td>
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<td>NPSO</td>
<td>National Patient Safety Office</td>
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<tr>
<td>ONMSD</td>
<td>Office of Nursing and Midwifery Services Director</td>
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<td>PEWS</td>
<td>Paediatric Early Warning System</td>
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<td>QCM</td>
<td>Quality Care Metrics</td>
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<td>Situation awareness</td>
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<td>Test Your Care</td>
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# Section 1. National Clinical Guideline recommendations

## 1.1 Summary of recommendations

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<tr>
<th>No.</th>
<th>Recommendation</th>
<th>*Grade/level</th>
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<tbody>
<tr>
<td>1</td>
<td><strong>Measurement and Documentation of Vital Signs and Other Observations</strong>&lt;br&gt;NEWS is an adjunct to complement clinical judgement. It is designed to aid clinical decision-making. It does not replace clinician judgement.</td>
<td>⨁◯◯◯</td>
</tr>
<tr>
<td>2</td>
<td>Observations must be recorded and documented in the NEWS patient observation chart for all patients admitted to an acute hospital at the time of admission or initial assessment.</td>
<td>⨁◯◯◯</td>
</tr>
<tr>
<td>3</td>
<td>A full set of NEWS observations should be undertaken and documented on the NEWS chart when a patient transitions between areas within a hospital or on discharge from a higher level of care (HLOC) or Theatre Recovery Room and again on arrival to the ward.</td>
<td>⨁◯◯◯</td>
</tr>
<tr>
<td>4</td>
<td>The NEWS physiological observations are:&lt;br&gt;➢ Respiratory rate&lt;br&gt;➢ Oxygen saturation (SpO2)&lt;br&gt;➢ Heart rate&lt;br&gt;➢ Blood pressure&lt;br&gt;➢ Temperature&lt;br&gt;➢ Level of consciousness&lt;br&gt;   o ACVPU (C=new confusion)&lt;br&gt;➢ Room air or supplemental oxygen (a score of ‘3’ is added for ‘any O2’ as an uplift to NEWS score)&lt;br&gt;A full set of NEWS physiological observations should be recorded on all occasions.</td>
<td>⨁◯◯◯</td>
</tr>
<tr>
<td>5</td>
<td>In the acute hospital setting the minimum standard for the assessment of observations is every six hours for the first 24 hours following admission and a minimum of every 12 hours monitoring thereafter if the patient’s clinical condition dictates. For every patient the frequency of monitoring of observations should be consistent with the clinical situation and history of the patient.</td>
<td>⨁◯◯◯</td>
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<tr>
<td>6</td>
<td>The NEWS Escalation &amp; Response Protocol provides guidance on suggested frequency of monitoring of vital signs relevant to the patient’s NEWS score. The need for more or less frequent monitoring should be determined and documented by a competent clinical decision maker (senior doctor (Registrar or Consultant)/ Advanced Nurse Practitioner or senior nurse.</td>
<td>⨁◯◯◯</td>
</tr>
<tr>
<td>7</td>
<td>A patient’s NEWS score or physiological parameter ranges must not be altered.</td>
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<tr>
<td>8</td>
<td>The patient’s NEWS chart (hard copy and/or digital) should display physiological information in the form of a trend graph. The NEWS includes:&lt;br&gt;➢ A system for tracking changes in physiological parameters over time&lt;br&gt;➢ Thresholds for each physiological parameter or combination of parameters that may indicate possible deterioration in patient condition</td>
<td>⨁◯◯◯</td>
</tr>
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</table>
### Escalation of Care

| 9 | There are patients for whom the routine recording of data for the NEWS may be inappropriate such as during end of life care where death is anticipated. In these circumstances, clinical teams may decide that modifications to the usual observations monitoring frequency and escalation protocol are appropriate. Such decisions should be discussed with the patient/family/carer and documented as a NEWS Escalation and Response Plan in the patient’s healthcare record. |

### Response Systems

| 16a | For the first 24 hours following admission the frequency of observations and the predetermined NEWS Escalation and Response Protocol should not be altered. |

| 16b | After 24 hours a senior medical doctor can modify the predetermined NEWS Escalation and Response Protocol based on a patient’s baseline, observations trend, clinical risk factors and NEWS score and document these modifications as a NEWS Escalation and Response Plan. |

| 17 | The NEWS Escalation and Response Plan should be reviewed by a Registrar or Consultant doctor every 24 hours. |
18. A NEWS Escalation and Response Plan will include at a minimum:
   - Rationale for modification of escalation and response
   - Timeframe for review of patient and response plan (minimum 24 hourly review)
   - Information about further action(s) and/or escalation

19. A tiered response model is recommended. A tiered response model will encompass the following elements:
   - Bedside response (NEWS scores of 0-2): nurse-led, ward-based response
   - Urgent response (NEWS scores of 3-6): response by a clinician or team with competence in the assessment and treatment of acutely ill patients e.g. Advanced Nurse Practitioner service. An urgent response can be called for scores of 0-2 if there is clinician concern.
   - Emergency response (NEWS scores of ≥ 7): as above in addition to staff with critical care competencies and diagnostic skills

   Escalation should occur for any patient with a score of 3 in any single parameter.

20. The Executive Management Team/Board in each hospital should agree and document their standardised local tiered response model.

21. Clinical staff responding to the deteriorating patient should:
   1. Be available to respond within agreed timeframes
   2. Be able to assess a patient and provide a provisional diagnosis
   3. Be able to undertake appropriate initial therapeutic intervention
   4. Be able to stabilise and maintain a patient pending decisions on further management
   5. Have authority to make transfer decisions and to access other care providers to deliver definitive care
   6. As part of the Emergency Response tier there should be access at all times to at least one clinician who can practice advanced life support e.g. ACLS certified
   7. In cases where patients need to be transferred to another acute hospital to receive emergency care, appropriate care needs to be provided until such assistance is available as per local policy

22. Events surrounding a call for assistance (time of call, response, plan of care and outcome) should be documented in the healthcare record. Records should be suitable for audit purposes as part of on-going quality improvement processes.

23. Clinicians providing response assistance should communicate with the primary medical practitioner or team in an acute hospital about the call for assistance, the response, the outcome and the future plan of care.

### Clinical Communication

24. The ISBAR clinical communication tool should be used when communicating information verbally and in writing between healthcare professionals.

   Where a patient’s condition and/or a situation is deemed to be critical, this should be clearly stated at the outset of the conversation.
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<tbody>
<tr>
<td>25</td>
<td>Safety huddles should be used as forums where staff/patient/family concerns can be raised and discussed. The use of visual management tools should be considered to enhance interprofessional communication.</td>
<td>🌟🌟🌟🌟</td>
</tr>
<tr>
<td>26</td>
<td>Following clinical review in response to an escalated NEWS a plan of care should be clearly documented and verbally communicated.</td>
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<tr>
<td>27</td>
<td>Information about deterioration should be communicated to the patient, family or carer in a timely and ongoing way, and documented in the healthcare record in keeping with patient consent and confidentiality.</td>
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<tr>
<td></td>
<td><strong>Leadership &amp; Governance</strong></td>
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<tr>
<td>28</td>
<td>Hospital management should appoint a Consultant lead and executive sponsor at senior management level with overall accountability for the ongoing performance and improvement of the NEWS system.</td>
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<tr>
<td>29</td>
<td>A formal hospital-level governance committee should be established in each hospital which has direct access to the Hospital Clinical Governance Committee. Where possible this forum should seek to align governance for sepsis, cardiac arrest, resuscitation, NEWS, PEWS, IMEWS, EMEWS, Mortality &amp; Morbidity, ICU admissions and discharges etc.</td>
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| 30 | The Governance Committee should oversee the ongoing performance and improvement of the anticipation, recognition, escalation, response and evaluation elements of the system locally. It should:  
1. Have appropriate responsibilities delegated to it and be accountable for its decisions and actions.  
2. Monitor the effectiveness of interventions and education.  
3. Have a role in reviewing clinical outcome data, and healthcare audits.  
4. Provide advice about the allocation and prioritisation of resources.  
5. Include service users, clinicians, managers and executives  
6. Develop quality improvement plans and report on progress | 🌟🌟🌟🌟 |
| 31 | A formal guideline/policy framework for the implementation of the NEWS National Clinical Guideline No. 1 should be in place and include issues such as:  
1. Governance arrangements.  
2. Roles and responsibilities.  
3. Communication processes.  
4. Safety huddles  
5. Resources for the Response System, such as staff and equipment.  
6. Education and training requirements.  
7. Evaluation, audit and feedback processes.  
8. Arrangements with external organisations that may be part of a response system.  
10. Patient and service user involvement. | 🌟🌟🌟🌟 |
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<tbody>
<tr>
<td>32</td>
<td>There should be appropriate policies and documentation regarding ‘Do Not Attempt Resuscitation’ decisions; treatment-limiting decisions (ceilings of care); and end-of-life decision making as they are critical in ensuring that the care delivered in response to deterioration is consistent with appropriate clinical practice and the patient’s expressed wishes.</td>
</tr>
<tr>
<td>33</td>
<td>Hospitals should support additional safety practices that enhance the NEWS. Incorporating briefings, safety pauses and huddles into practice can lead to greater situation awareness amongst clinicians and multi-disciplinary teams.</td>
</tr>
<tr>
<td>34</td>
<td>Clinical staff in all acute hospitals should complete NEWS education and training and maintain their knowledge and skills in NEWS. On induction to an organisation all medical, nursing and therapies staff should become familiar with a hospital’s NEWS Escalation and Response Protocol.</td>
</tr>
<tr>
<td>35</td>
<td>Education and training on the use of the NEWS system should form part of undergraduate curricula in nursing, medical and health and social care professionals’ programmes. The Department of Health/National Patient Safety Office and the Health Service Executive should work with academic partners to ensure that students have undertaken NEWS training prior to undertaking clinical placements.</td>
</tr>
<tr>
<td>36</td>
<td>As response teams evolve consideration should be given to the development of education and training programmes focusing on relevant competencies and skills.</td>
</tr>
<tr>
<td>37</td>
<td>Clinical and healthcare audit data should be collected and reviewed locally by interprofessional teams to inform improvement and patient outcomes.</td>
</tr>
<tr>
<td>38</td>
<td>All audits should be reviewed by the relevant governance committee and findings escalated upwards to the Hospital Clinical Governance Committee/Senior Management Team and to all levels of staff where NEWS is used.</td>
</tr>
<tr>
<td>39</td>
<td>NEWS implementation and sustainability should form part of the hospitals patient safety and quality improvement strategy. It should be supported through the application of quality improvement methods, such as engagement strategies, testing and measurement to ensure successful implementation, sustainability and future progress.</td>
</tr>
<tr>
<td>40</td>
<td>National and local health service organisations should seek opportunities to align their systems to support best practice and maximise patient safety. For example, aligning systems for end-of-life care with NEWS will help to ensure co-ordinated and effective care for patients whose condition is irreversibly deteriorating.</td>
</tr>
<tr>
<td>41</td>
<td>A move towards a digital NEWS should be incorporated into service planning and development. These systems should enhance patient safety care processes and clinician/patient interaction.</td>
</tr>
</tbody>
</table>
* See Appendix 2: Literature search strategy for information on grading of certainty of evidence
Section 2: Development of the National Clinical Guideline

2.1 Background

Unanticipated cardiorespiratory arrests (CRAs) and unplanned admissions and readmissions to the Intensive Care Unit (ICU) in the adult non-pregnant acute hospital inpatient are now referred to as serious adverse events (SAEs) in the international literature (Bunkenborg et al. 2014, DeMeester et al. 2012 and 2013, Ludikhuize et al. 2014, Petersen et al. 2016, Simmes et al. 2013, Smith et al. 2012). Internationally it has been recognised that these events are no longer considered ‘the norm’, that is, an accepted outcome of hospitalisation, but instead are considered ‘harm’ events.

When a patient is admitted to hospital acutely unwell, or deteriorates while in hospital and becomes acutely unwell, time is critical in the prevention of irreversible deterioration and death. A system encompassing the anticipation, early recognition, escalation, competent clinical response and closed loop governance is necessary to assist clinicians in preventing irrevocable deterioration and death. A systematic review of the literature identified 47 different early warning systems (EWS) in use internationally (HRB-CICER 2018). The National Early Warning System, based on the VitalPac EWS (ViEWS) is in use in Ireland since 2013.

Unanticipated cardiorespiratory arrest is defined as that which occurs in a patient in the ward environment where a Do Not Attempt Resuscitation order was not documented. Physiological abnormalities occur in the majority of these patients in the 12 to 24 hours prior to cardiorespiratory arrest, detectable by measurement of a patient’s vital signs. If detected and acted upon cardiorespiratory arrest and possible death may be prevented. Internationally, reported rates of unanticipated cardiorespiratory arrests per thousand discharges in acute hospitals range between 3.54/1,000 discharges (Goncales et al 2012) in São Paulo, Brazil, 3.28/1,000 discharges (Beilter et al 2011) in Boston, Massachusetts and 3.1/1,000 discharges (Sebat et al. 2018) in California, USA. A death which occurs as an outcome of an unanticipated cardiorespiratory arrest is defined as a *preventable death* as failure of healthcare professionals to recognise patient deterioration contributed to the death.

In the four year period between 2015 and 2018 3,592 unanticipated cardiopulmonary arrests were recorded to have occurred in patients in the twenty-six Model 3 and Model 4 acute hospitals in Ireland. 44% (1,580) of these patients died. Events were captured on the HIPE system using NQAIS Clinical data. It is reasonable to assume that a proportion of these patients would have benefited from being on an end-of-life care (EOLC) pathway and thus should not be included in these numbers. However, a recent single-centre study conducted in a Model 4 hospital in Ireland demonstrated that not all such events are captured using HIPE coding and the true figure may be nearer to double the number of events recorded (ref to be added...).
2.2 Clinical and financial impact of condition/disease/topic

A systematic review of the literature was commissioned by the National Patient Safety Office and undertaken by the Health Research Board – Collaboration in Ireland for Clinical Effectiveness Reviews (HRB-CICER) to underpin this NEWS guideline update. Sixty-eight studies were identified which investigated the predictive ability of one or more early warning system. Studies included were those which used mortality, cardiac arrest, unplanned admission to ICU or length of stay as primary outcome measures. Relatively little high quality evidence emerged evaluating the predictive ability of NEWS. Included studies found a wide range of early warning system interventions, variation in the definitions of outcomes used from study to study, variation in study populations, low event rates and small study sizes. The content and grade of recommendations in the updated NCG No. 1 (NEWS) therefore reflects the expert consensus opinion of the NEWS Guideline Development Group and NEWS Consultant Advisory Group alongside the available evidence (literature review, focus groups, audit).

While the NEWS system has been in use in acute hospitals in Ireland since 2013 no national data exists determining the clinical or financial impact of NEWS. The majority of hospitals collect data on in-hospital cardiopulmonary arrests; however there is currently no minimum data set or central collation system of this data. A national clinical audit has not been undertaken in relation to the measurement of in-hospital unanticipated cardiopulmonary arrests. The absence of digital NEWS systems prevents large-scale research or audit. The DPIP explored HIPE data using NQAIS Clinical and determined that in the four year period between 2015 and 2018 3,592 unanticipated cardiopulmonary arrests were recorded to have occurred in patients in the twenty-six Model 3 and Model 4 acute hospitals in Ireland. This provides a baseline from which to improve.

Many recommendations in this guideline represent existing good practice and are therefore cost neutral. Implementation is addressed in the Implementation Plan (Appendix 6 – under development) and the Budget Impact Analysis (Appendix 5 – awaited from HRB-CICER). It is not possible to estimate savings related to improved outcomes until a national evaluation of NEWS takes place, to include economic impact. It is also important to note that inadequate monitoring, and subsequent failure to recognise patient deterioration, may increase financial costs associated with adverse outcomes and, in some cases, legal claims.
2.3 Rationale for this National Clinical Guideline

Acute physiological deterioration is a time-crucial medical emergency and failure to detect and treat patient deterioration in a timely manner poses a threat to patient safety, which may lead to adverse patient outcomes. Deterioration of a patient’s condition in hospital is frequently preceded by measurable physiological abnormalities. Regular measurement and documentation of physiological parameters is an essential requirement for recognising clinical deterioration. Early recognition of clinical deterioration, followed by prompt and effective action, can minimise the occurrence of adverse events such as cardiac arrest, and may mean that a lower level of intervention is required to stabilise a patient.

Health care organisations adopt a multi-faceted approach including four main categories of interventions to detect and manage deteriorating patients more effectively (rapid response teams [RRTs]/medical emergency teams [METs], early warning systems [EWS], education programmes for health care staff, and standardised approaches to patient handover). The overarching aim of these interventions is to facilitate early detection of deterioration by categorising an adult patient’s severity of illness and prompting escalation of care as appropriate.

Traditionally, early warning systems have come in two primary configurations: single parameter criteria and aggregated weighted scores. The former originated in Australia over two decades ago as a set of equally weighted abnormal physiologic thresholds, the presence of any of which would trigger the system. In contrast, aggregated weighted scoring systems, such as the Modified Early Warning Score (MEWS), which was developed in the UK, involve summing up points from multiple parameters based on the degree of derangement.

The National Early Warning System (NEWS) was the first National Clinical Effectiveness Committee (NCEC) National Clinical Guideline (NCG) commissioned and endorsed by the Minister for Health. It was published in February 2013 and a subsequent update to the guideline to include additional practical guidance specific to sepsis management was approved by the NCEC in August 2014. Subsequently, an updated systematic search of the literature specific to EWS in adult patients was completed in 2015 by a team from University College Cork (UCC). Guideline revision commenced in 2018 supported by a further updating of the systematic review of the literature (2015 to 2018), commissioned by NPSO/NCEC and conducted by HRB-CICER; two additional clinical questions were included in this review. The evolution of early warning systems internationally was reflected in the breadth of the literature identified, appraised and included in this review update.

The NEWS facilitates the timely assessment of, and response to the deterioration of acutely ill patients by:

- Classifying the severity of a patient’s illness
- Providing prompts and structured communications tools to escalate care
- Following a definitive escalation plan
Providing a clear, structured response model

Patient’s vital signs (blood pressure, pulse, respirations etc.) are routinely recorded in acute hospitals. With the NEWS, each vital sign is allocated a numerical score from 0 to 3, on a colour coded observation chart (a score of ‘0’ represents the least risk and a score of ‘3’ represents the highest risk). Scores are then combined to give the patient’s NEWS score. The NEWS scoring key can be seen in Figure 1. The NEWS observation chart can be seen at ...insert link once available. A trend can be seen indicating an improvement in the patient’s condition with a lowering of the score or deterioration in condition with an increase in the score, thereby facilitating monitoring of the patient’s health status. Depending on the score, care can be escalated to senior medical staff as appropriate. The NEWS is a clinical assessment tool and does not replace the clinical judgement of a qualified health care professional. Where there are concerns regarding a patient’s condition, staff can escalate care based on clinical concern and should not hesitate in contacting a senior member of the patient’s medical team to review the patient, irrespective of the NEWS. Patient/family/carer concern is also an important indicator for patient deterioration and can initiate a trigger for clinical review.

<table>
<thead>
<tr>
<th>SCORE</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
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<th>2</th>
<th>3</th>
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<tr>
<td>Respiratory Rate (bpm)</td>
<td>≤ 8</td>
<td>9 - 11</td>
<td>12 - 20</td>
<td>21 - 24</td>
<td>≥ 25</td>
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<tr>
<td>SpO₂ (%)</td>
<td>≤ 91</td>
<td>92 - 93</td>
<td>94 - 95</td>
<td>≥ 96</td>
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<td>Inspired O₂ (FiO₂)</td>
<td>Air</td>
<td>Any O₂</td>
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<td>Systolic BP (mmHg)</td>
<td>≤ 90</td>
<td>91 - 100</td>
<td>101 - 110</td>
<td>111 - 249</td>
<td>≥ 250</td>
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<tr>
<td>Heart Rate (BPM)</td>
<td>≤ 40</td>
<td>41 - 50</td>
<td>51 - 90</td>
<td>91 - 110</td>
<td>111 - 130</td>
<td>≥ 131</td>
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<tr>
<td>ACVPU/CNS Response</td>
<td>Alert (A)</td>
<td>Confusion (C), Voice (V), Pain (P), Unresponsive (U)</td>
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<td>Temp (°C)</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>
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Figure 1: NEWS Scoring Key

On commencement of the revision of the NEWS guideline, and because the NEWS had been in use in the system for six years, a multidisciplinary focus group of NEWS users was held in October 2017 to capture what had worked to date and what needed improvement. Subsequently a number of focused workshops were held with medical interns and registrars. Nine key themes were identified through the focus group work. These themes facilitated the development of problem statements which guided the subsequent Root Cause Analysis. Key themes which emerged were

- Physiological parameter adjustment
- Escalation and documentation of escalation
  - Escalation response - systems and people
- Governance (leadership/audit/evaluation/feedback loop)
- Over-reliance on score versus clinical judgement
- EWS seen as nurse-led with little MDT engagement
Communication/ISBAR
❖ Patient and family engagement
❖ Education

Further information can be found in the Focus Group summary report available on request from the DPIP team.

Findings from the original focus group informed the additional two questions for the systematic review of the literature. These questions pertained to escalation of care and alternative early warning systems for sub-populations, for example, respiratory patients. Through the process of review of NEWS (2013) recommendations, international evidence, audit and focus group findings some key clinical issues emerged which required senior clinical input. As a result a Consultant Advisory Group (CAG) was established by the Chief Clinical Officer (CCO) in the HSE. Recommendations in NEWS (2020) reflect this senior clinical input. CAG membership can be seen in Appendix 1c. Letter of invitation from CCO to CAG members can be seen in Appendix 1d.

The revised NCG No. 1 NEWS (2020) emphasises an anticipatory approach to the management of deterioration. This means highlighting the role of situation awareness in the detection of deterioration with a subsequent increased focus on those patients with low or ‘no’ NEWS scores. These patients are often the most vulnerable to unrecognised deterioration. Anticipatory care involves the use of situation awareness by staff, that is, ‘knowing what is going on’ for each patient so that the potential for deterioration can be detected and acted upon.

2.4 Aim and objectives
The NEWS aims to provide guidance to hospital executives, managers and healthcare professionals on best practice in ensuring safe, timely, effective and standardised care in the anticipation, recognition, escalation, response and governance of the acutely unwell non-pregnant adult patient (≥16 years) in the acute hospital setting.

2.5 Guideline scope
The NEWS applies to the non-pregnant adult (≥ 16 years) patient in an acute hospital. The NEWS does not apply to children or pregnant women or patients being assessed in emergency departments (ED) or primary care settings. Early detection of deterioration in these groups of patients is identified by different physiological parameters and signs to those of adult patients admitted to acute hospitals. Three other early warning systems were developed for these patient groups: the Paediatric Early Warning System (PEWS) to detect deterioration in paediatric patients and the Irish Maternity Early Warning System (IMEWS) to detect deterioration in the pregnant woman are currently in use in all paediatric and maternity services in Ireland; the Emergency Medicine Early Warning System (EMEWS) for use in EDs is being implemented on a phased basis.
The National Clinical Guideline No. 1 (NEWS) relates to the situation in an acute hospital setting, where an adult patient’s physiological condition is deteriorating. The general provision of care in an acute hospital is outside the scope of this document.

The National Clinical Guideline focuses on ensuring that a whole system response is in place to anticipate, recognise and respond to the clinically deteriorating patient. A whole system response involves creation of situation awareness, a bedside ‘track and trigger’ tool as an adjunct to clinician anticipation of deterioration, an escalation protocol, an appropriate tiered clinician response and over-arching governance to include after action review, audit and improvement cycles. This guideline outlines the clinical processes and the organisational leadership and governance required to implement the guideline.

The National Clinical Guideline does not apply to children or patients in obstetric care, as early detection of deterioration in these two groups of patients are identified by different physiological parameters and signs to those of adult patients in acute hospitals (refer to NCG No. 12 PEWS 2016 and NCG No. 4 IMEWS V2 2019).

The National Clinical Guideline No. 1 NEWS (2020) applies to all adult non-pregnant patients (≥16 years) in acute hospitals. This includes:

❖ All inpatients on initial assessment and as per clinical condition and clinical treatment.
❖ Any outpatient/day service patients who attend acute hospitals for an invasive procedure or who receive sedation.
❖ All patients attending an Acute Medical or Surgical Assessment Unit.

The National Clinical Guideline applies to healthcare professionals, doctors, nurses, physiotherapists and other staff involved in the clinical care of patients and managers responsible for the development, implementation, review and audit of deteriorating patient recognition and response systems in individual hospitals or groups of hospitals. The National Clinical Guideline also applies to education and training support staff involved in the organisation and delivery of the education programme.

2.6 Conflict of interest statement

The NEWS guideline revision process followed the conflict of interest policy set out by the NCEC. All members of the NEWS GDG, the NEWS CAG and the NCEC QA appraisal team were required to complete a Conflict of Interest declaration which was managed by the Project Lead and the CEU respectively. There were no conflicts of interest stated.

2.7 Sources of funding

No external funding was received for this project. The systematic review of the literature and the budget impact analysis (BIA) were funded by the Department of Health.
2.8 Guideline methodology

Reproduced below is an extract of the *Clinical effectiveness and Cost-effectiveness of National Early Warning System (NEWS): a systematic review update*. The full systematic review was written by the Health Research Board - Collaboration in Ireland for Clinical Effectiveness Reviews (HRB-CICER). The detailed search strategy can be seen in Appendix 2. See Annex 1 for the full systematic review – these will be added once drafts finalised.

**Step 1: Formulate the key questions**

The aim of the HRB-CICER systematic review was to update a systematic review of the clinical and economic literature on EWSs (also known as track and trigger systems) used in adult (non-pregnant) patients in acute health care settings for the detection or timely identification of clinical deterioration, with a particular focus on the NEWS. Any changes in the totality of the evidence on the NEWS for use in the assessment of adult patients in the acute health care setting will be used to inform the update of the NEWS NCG.

The proposed review questions for this update fell under the remit of two overarching categories as per the NCG:

1. **CLINICAL PROCESSES**
   - Measurement and documentation of observations
   - Escalation of care
   - Emergency Response Systems
   - Clinical communication

2. **ORGANISATIONAL PROCESSES**
   - Organisational supports
   - Education
   - Evaluation, audit and feedback

The review questions were as follows:

**Q1.** What EWSs or track and trigger systems are currently in use for the detection or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings? In line with the previous review update, studies investigating the development and efficacy of various EWSs will be compared under the following categorisations:

- Type of EWS
- General acute patients or specific sub-populations
- Vital sign parameters recorded and weightings given to each vital sign
- Single-parameter EWS compared to aggregate EWS
- Evaluation of chart design (paper-based EWS compared to digital EWS)
- Implementation of EWSs and/or RRTs
Q2. How effective are the different EWSs in terms of improving key outcomes in adult (non-pregnant) patients in acute health care settings?

Primary Outcomes:

- Mortality
- Cardiac Arrest
- Length of stay (LOS)
- Transfer/admission to the Intensive Care Unit (ICU)

Secondary outcomes:

- Clinical deterioration in sub-populations
- Any other outcomes identified post-hoc

Q3. What education programmes (e.g. COMPASS©, other) have been established to train health care professionals (HCPs) relating to the implementation of EWSs or track and trigger systems for the detection or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?

3.1 How effective were the various education programmes?

Primary outcomes:

- Increase in knowledge and performance
- Effect on patient outcomes
- Improved patient rescue strategies

Secondary outcomes:

- Improved documentation of patient observations
- Improved compliance
- Any other outcomes identified post-hoc

Q4. What are the findings from the economic literature on cost-effectiveness, cost impact and resources involved with the implementation of EWSs or track and trigger systems for the detection or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?

Review questions 1-4 are consistent with those set out in the previous searches which informed the NEWS guideline published in 2013, and a subsequent systematic review update
in 2016. The purpose of this systematic review was to update the evidence for these four questions. A new search was conducted for the two additional new questions (5 and 6).

The new review questions are as follows:

Q5. Are modified EWSs (e.g. the Chronic Respiratory Early Warning Score [CREWS]) more effective than the NEWS for the detection or timely identification of physiological deterioration in the following adult sub-populations in acute health care settings?
  - Frail older adults
  - Patients with chronic respiratory conditions (including chronic hypoxia, chronic physiological abnormalities and chronic obstructive pulmonary disease [COPD])

The NEWS is based on an EWS designed to maximise both sensitivity (the ability to detect patients at risk of dying) and specificity (the minimisation of false alarms) for unselected patients admitted to acute settings. The aim of question 5 is to investigate whether modified EWSs (such as CREWS) can improve specificity and maintain sensitivity in specific sub-populations where NEWS has been shown to trigger false alarms.

Q6. Why do HCPs fail to escalate as per the NEWS escalation protocol? The previous systematic review update conducted by UCC highlighted that HCPs were failing to escalate as per protocol and identified a number of barriers based on suggestions extracted from the literature. However, an in-depth understanding as to ‘why’ this is happening requires a qualitative approach to be included in this review update.

Step 2: Search methodology

Searches were conducted consistent with the search strategy developed by the research team involved in the previous review. Key terms and their variations were associated with the PICOS (Population/Patient/Problem, Intervention, Comparison, Outcome, Study design) framework which is applicable when addressing a clearly defined clinical question relevant to a defined population group and clinical context. Key terms included a combination of terms associated with “early warning scoring systems”. The search strategy is detailed in Appendix 2. The economic literature search was based on the clinical literature search strategy with the addition of an economic filter for the Medline and EMBASE search. The full literature review is available at [link to be added once available from HRB-CICER](#).

Step 3: Screen and appraise the evidence

Two reviewers independently assessed the methodological quality or risk of bias of included studies, using standardised critical appraisal instruments, with any disagreements resolved through discussion. Different study designs warranted different tools to assess methodological quality, thus a number of different instruments were used as appropriate (Table 3).
Table 3: Critical Appraisal Instruments

<table>
<thead>
<tr>
<th>Study category</th>
<th>Critical appraisal instrument</th>
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<tbody>
<tr>
<td>RCTs</td>
<td>Cochrane Risk of bias tool(23)</td>
</tr>
<tr>
<td>NRCTs, CBA studies, ITS studies</td>
<td>Risk of bias criteria for Cochrane EPOC reviews(24)</td>
</tr>
<tr>
<td>Clinical practice guideline</td>
<td>AGREE II tool, ‘rigour of development’ domain (National Quality Assurance Criteria for Clinical Guidelines(25)</td>
</tr>
<tr>
<td>Observational designs</td>
<td>Newcastle Ottawa Scale(26)</td>
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<tr>
<td>Economic evaluations</td>
<td>1. CHEC-list for quality assessment(27), 2. ISPOR to assess transferability(28)</td>
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<td>Development &amp; validation studies</td>
<td>The QUADAS 2 Tool(29)</td>
</tr>
<tr>
<td>Qualitative studies</td>
<td>CASP(30) Qualitative Checklist</td>
</tr>
</tbody>
</table>


The Newcastle Ottawa Scale quality appraisal tool was used for observational studies.

**Step 4: Develop and grade the recommendations**

*Review Questions 1-5*

Where appropriate, 'Summary of findings' (SOF) tables using the GRADEpro software were generated for the primary outcomes of each review question. The certainty of the evidence for each outcome was assessed using the GRADE approach as outlined in the GRADE handbook where appropriate. We downgraded the evidence from high quality by one level for serious (or by two levels for very serious) limitations, depending on our assessments of the risk of bias, indirectness of evidence, serious inconsistency, imprecision of effect estimates, or potential publication bias. Evidence was graded as high, moderate, low or very low.

*Review question 6*

For qualitative studies, we used the GRADE-CERQual (Confidence in the Evidence from Reviews of Qualitative research) approach to summarise our confidence in the evidence. Four
components contribute to an assessment of confidence in the evidence for an individual review finding: methodological limitations, relevance, coherence, and adequacy of data. The CERQual components reflect similar concerns to the elements included in the GRADE approach for assessing the certainty of evidence on the effectiveness of interventions. However, CERQual considers these issues from a qualitative perspective. Confidence in the evidence was graded as high, moderate, low, or very low for each key finding.

The strength of the recommendation was decided following a process of considered judgement by the NEWS GDG that took into account the problem priority, potential benefits and harms of the options, resource use, equity, acceptability, feasibility and the available evidence as described.

A strong recommendation reflects the NEWS GDG's consensus that the potential positive outcome is highly valued, benefits will outweigh the harms and the cost implications are justified. A conditional recommendation reflects the NEWS GDG's consensus that the balance between benefit and harm is uncertain or the feasibility of implementation is uncertain or likely to be difficult. Good practice points that denote recommended best practice based on clinical expertise of the NEWS GDG are also included. In addition, the NEWS GDG has offered practical guidance where it is felt that this may aid implementation. All recommendations are of equal importance and should be implemented without preference or bias. The recommendations are presented in the following domains:

<table>
<thead>
<tr>
<th></th>
<th>Measurement and Documentation of Vital Signs and Other Observations</th>
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<tbody>
<tr>
<td>2</td>
<td>Escalation of Care</td>
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<td>3</td>
<td>Response Systems</td>
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<td>4</td>
<td>Clinical Communication</td>
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<td>5</td>
<td>Leadership &amp; Governance</td>
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<tr>
<td>6</td>
<td>Education</td>
</tr>
<tr>
<td>7</td>
<td>Evaluation, Audit &amp; Feedback</td>
</tr>
<tr>
<td>8</td>
<td>Systems to Support High Quality Care</td>
</tr>
</tbody>
</table>

2.9 Consultation summary
The NEWS GDG ensured that all stakeholders had an opportunity to contribute to the revision of the NEWS national clinical guideline. Focus groups were held with frontline staff throughout the revision process including nurses, health and social care professionals and Non-Consultant Hospital Doctors (NCHDs – interns and registrars). Additional focus groups
were held specifically to gain insight into NEWS chart design in terms of ease of use and user-friendliness. Human factors expertise was sought when updating the NEWS chart.

The final draft of NCG No. 1 NEWS (2020) was circulated to the following for review and feedback:

- Group Directors and Directors of Nursing all Hospital Groups and all acute hospitals
- Clinical Directors Hospital Groups and acute hospitals
- ONMSD and all NMPDUs/CNMEs
- National Clinical Programme Clinical Leads for Surgery, Anaesthesia, Acute Medicine, Emergency Medicine, Critical Care, Sepsis, Paediatrics
- Dr. Colm Henry, Chief Clinical Officer, HSE
- Nursing and Midwifery Board of Ireland (NMBI)
- Schools of Nursing and Midwifery, HEIs, Ireland
- Colleges of Medicine, HEIs, Ireland
- Patient forums
- Regulatory bodies
- Hospital/Group CEOs and GMs
- Professional bodies

2.10 External review

International external review of the revised NEWS guideline was completed by three experts in their respective fields:

1. Professor Imogen Mitchell, Dean of Medicine, Australia National University, Senior Intensive Care Specialist, Canberra Hospital and Senior Medical Advisor Australian Commission on Safety and Quality in Healthcare
2. Professor Peter Watkinson, Associate Professor of Intensive Care Medicine, Joint Clinical Lead for Critical Care Research Group, John Radcliffe Hospital, Oxford
3. Dr. Mandy Odell, Nurse Consultant Critical Care, Royal Berkshire NHS Foundation Trust

The NEWS GDG is very grateful to these reviewers and appreciates the time commitment and expertise that was involved in their review. Reviewers were asked to consider the guideline in accordance with the questions recommended by the National Quality Assurance Criteria for Clinical Guidelines Version 2 (HIQA/NCEC, 2015, p.14). External reviewers were also asked to provide any additional feedback they felt was relevant. All feedback will be reviewed and incorporated into the revised guideline where appropriate.

Human factors expertise was acquired when revising the NEWS chart as were the views of frontline staff who use the NEWS chart on a daily basis.

2.11 Implementation

A comprehensive implementation plan for this guideline is outlined in Appendix 6 (under completion). The National Early Warning System (NEWS) now refers to an early warning system rather than an early warning score as in the original version in 2013. This is the result
of the evolution of early warning systems internationally and the recognition that a system reflects all elements of the management of the acutely unwell patient in the acute hospital setting – anticipation, recognition, escalation, response, assessment, intervention, reassessment, education, evaluation and governance. Each hospitals’ senior management team, in conjunction with the designated local implementation leads, should review NCEC NCG No.1 NEWS (2020), to appropriately plan implementation and recognise the system-wide implications.

It is recommended that hospitals use quality improvement (QI) methodology when implementing and seeking to improve the use of the National Early Warning System (NEWS). Such methods enhance stakeholder engagement, empowerment and adoption through the use of testing, measurement and feedback on key interventions. Recognition must also be given to the complex task of improving the patient safety climate and culture (beliefs, attitudes and actions) that successful implementation of the NEWS is dependent upon.

It is recommended that local governance groups (NEWS (2020) Recommendation 29) are established to direct ongoing implementation and evaluation. Many hospitals now use a variety of early warning systems (IMEWS, PEWS, EMEWS, Sepsis); consideration should be given to aligning and harmonising the governance of these systems. Governance groups should be multidisciplinary, have a designated senior consultant clinical lead and senior hospital management sponsorship. There should be designated local NEWS/EWS medical and nursing co-ordinators within the membership of the governance group to coordinate implementation, education and evaluation, inclusive of audit. The governance group should regularly report directly to the hospital senior management team and should actively engage with the hospital quality and risk governance structures. Patient representation should be strongly considered on these governance groups. Patient outcomes aligned to effective management of clinically deteriorating patients, for example, unanticipated cardiopulmonary arrests, unplanned admissions to ICU, should be reviewed to determine the elements of the system in need of focussed quality improvement efforts.

Some of the potential enablers and barriers for implementation of NEWS are listed in Table 4. These are similar to the enablers and barriers to implementation of other early warning system guidelines - NCEC NCG No. 4 IMEWS V2, NCG No. 12 PEWS and NCG No. 18 EMEWS. Local issues should be identified and action plans initiated to manage improvement at local hospital level. Hospital Groups may consider the use of a quality improvement collaborative style approach.

Table 4. Summary of enablers and barriers to the implementation of NEWS (2020).

<table>
<thead>
<tr>
<th>Enablers</th>
<th>Barriers</th>
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<tbody>
<tr>
<td>• Acute clinical deterioration</td>
<td>• Staff familiarity with current NEWS and</td>
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<tr>
<td>designated a patient safety priority at</td>
<td>resistance to change of practice</td>
</tr>
<tr>
<td>senior management team level</td>
<td>• Absence of clearly defined roles and</td>
</tr>
<tr>
<td>• Clinical champion(s) and good local</td>
<td>responsibilities</td>
</tr>
<tr>
<td>leadership</td>
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</tbody>
</table>
• Clearly defined roles and responsibilities
• Effective governance with direct reporting to hospital senior management team
• Effective multidisciplinary teamwork
• Effective communication pathways
• Complementary safety initiatives such as huddles/safety pause/briefings use of situation awareness
• Clear protocol for the safe and timely transfer of patients to a higher level of care (both internally and externally)
• Multidisciplinary team tiered response model
• Ongoing targeted education and training and reinforcement of learning
• Regular audit and evaluation with the results informing quality improvement work
• Patient/family/carer engagement and coproduction of improvements
• Digital observation recording and alert systems
• Conduction and dissemination of research evidence related to NEWS

• Ill-defined or inappropriate governance arrangements
• Lack of adequate resources e.g. staff, equipment, audit, time designated to provide clinical leadership
• Lack of staff familiarity with escalation and response protocols
• Lack of clear escalation and response policies and protocols
• Inadequate communication systems lacking in clarity, standardisation, accountability
• Inadequate access to education, lack of development of appropriate skill set required for urgent and emergency responders
• Inadequate audit and evaluation schedule and resources. Lack of adequate systems to support audit e.g. ICT, data and analytics expertise
• Resistance to patient/family/carer involvement with audit, evaluation, improvement
• Absence or poorly formed/supported complementary safety initiatives
• NEWS viewed as a score rather than a system therefore tendency to unidisciplinary implementation
• Absence of multidisciplinary tiered response model

Barriers to implementation should be identified and addressed as part of the organisational quality improvement and patient safety agenda. Attention to the enablers listed above and in the implementation plan in Appendix 6 (under completion) will provide guidance to local sites and Hospital Groups for service planning, development and implementation.

For full implementation of this guideline, it is essential that all healthcare professionals responsible for the care of adult non-pregnant patients in an acute hospital understand their responsibility, accountability and authority for improving care to clinically deteriorating patients. Improvement should occur in all phases to include anticipation, recognition, escalation, response, assessment, intervention, reassessment, evaluation, education and governance. This must be supported by clear lines of accountability, which include systems that can detect, and correct lapses in appropriate, reliable safe care in a timely basis as outlined in NCEC NCG No 1 NEWS (2020).
Funding for NEWS implementation and improvement is subject to service planning and the estimates process. However, many recommendations in NEWS represent a reiteration of previous good practice and existing NEWS implementation and are thus cost neutral as outlined in the Budget Impact Analysis (BIA) (Appendix 5) (full BIA report available in Annex xxx – to be included once available from HRB-CICER).

**Senior Manager responsibilities:**
- Agree and provide a local governance structure to support the implementation, ongoing audit and evaluation of patient outcomes pertaining to the recommendations of the NCEC NCG No.1 NEWS (2020).
- Assign personnel with delegated responsibility, accountability authority and autonomy to implement and evaluate the NCEC NCG No. 1 NEWS (2020). Provide documented clear roles and responsibilities for staff.
- Provide managers and clinician leads with support to implement the NCEC NCG No.1 NEWS (2020) and ensure clinical staff have access to and undertake education and training as appropriate to the successful implementation and evaluation of NEWS.
- Ensure local policies, protocols and procedures are in place to support implementation and are regularly adapted based on new learning and as a result of quality improvement work.
- Seek regular reports on implementation and evaluation of NEWS from the NEWS/EWS governance group and provide direction on subsequent action plans.
- Enable and support implementation coordinators and governance group by providing a direct link to corporate governance team/senior management team.
- Plan for the procurement and implementation of digital technologies through the estimates and service planning processes to support implementation and evaluation of NCEC NCG No.1 NEWS (2020).

**Clinician responsibilities:**
- Ensure familiarity with and comply with the NCEC NCG No.1 NEWS (2020) and related hospital policies, protocols and procedures.
- Adhere to relevant code of professional conduct and scope of professional practice appropriate to role and responsibilities.
- Develop and maintain relevant competencies in the anticipation, recognition, escalation, response, assessment, intervention, reassessment and evaluation of the clinically deteriorating adult non-pregnant patient in an acute hospital.
- Be aware of the role of clinical judgement, anticipatory care and delegation, in using the NCEC NCG No.1 NEWS (2020).
- Support the development of a tiered response model and current/future development of response teams e.g. Advanced Nurse Practitioner Response Service.
- Seek to provide clinical leadership, mentorship of staff and ongoing education of multidisciplinary team.
➢ Advocate on behalf of patients and staff to hospital senior management for the robust development of systems and service improvement to support implementation, improvement and evaluation of NCEC NCG No.1 NEWS (2020).
➢ Create and lead engagement with patient/family/carer to co-produce quality improvement initiatives for NEWS.
➢ Participate in relevant education programmes and contribute to education and training programme development
➢ Advocate for and use digital technologies to support implementation and evaluation of NCEC NCG No.1 NEWS (2020).
➢ Promote and engage in research to improve NEWS.
➢ Assist with the performance of clinical and healthcare audits associated with NEWS.

**Tools provided as supports for the implementation of NCEC NCG No.1 NEWS (2020)**

➢ The revised NEWS e-learning programme is available on HSEland (provide link once available).
➢ Implementation guidance is included in detail in Appendix 6 (under completion)
➢ The NEWS Physiological Parameter Scoring Key can be seen in Section 2.3 of the NCG No. 1 NEWS (2020)
➢ Audit tools are available in Appendix 8 (under completion)
➢ The NEWS Escalation and Response Protocol is available at (provide link once available)

### 2.12 Monitoring and Audit

Regular audit is required to support implementation of the recommendations within this revised NCG. It is recommended that the audit process is coordinated locally in each acute hospital by the local Deteriorating Patient Committee, as per the NCEC NCG No 1 NEWS (2020) recommendations. It is recommended that the NEWS audit process is undertaken from a multidisciplinary perspective where appropriate. In planning the audits to be undertaken, consideration should be given to the frequency of the audits and competencies required to conduct, interpret, and compile the final report and recommendations.

**NEWS Audit Datasets**

**Process Measures**

**NEWS Chart Completion Audit**

The audit for chart completion may be coordinated in each acute hospital using the Nursing and Midwifery Quality Care Metrics via the Test Your Care IT platform
This data collection and analysis is carried out on a monthly basis. If this option is not available, sample audit charts are available in Appendix 8. It is recommended that for either option, acknowledging and monitoring the compliance to documentation is completed as outlined below.

**Monitoring compliance**

A compliance score can be calculated. The score, expressed as a percentage, is calculated by dividing the number of “yes” answers by the total of “yes” and “no” answers. “Not applicable” answers are excluded from the calculation of the percentage score.

Example: If there are 9 “yes” and 2 “no” answers, the score is calculated as follows: 9 (yes answers) divided by 11 (total of yes and no answers) multiplied by 100. The score in this example would be 81.8%

The recommended standard required is 100% compliance. Where the compliance is less than 80% it is proposed that local action plans are put in place, e.g. increase frequency of audits and identify problem areas. Quality improvement methodology should be applied to implement a sustainable solution for problem areas.

**Escalation and Response audit**

A more detailed audit should be carried out for patients triggering a NEWS score of 3 or more.

**Utilization of ISBAR communication tool**

The use of ISBAR communication tool for communication in relation to deteriorating patient should be audited. This can be done through the National Clinical Guideline ‘Communication (Clinical Handover) in Acute and Children’s Hospital Services’ Audit Tool Sample template Appendix 8.

All sample audit tools to support the recommended NEWS audits above are available in the Appendices of this document.

**Outcome Measures**
The following suggested outcome measures are based on international best practice and should be included in the hospital’s planned patient safety and quality improvement audit cycle. Some of these outcome measures are supported by national clinical audit e.g NOCA Irish National ICU Audit

- Patient outcome measures e.g. Hospital length of stay (HLOS), ICU length of stay, mortality rates
- Number of Unanticipated Cardiopulmonary Arrests (ward based arrests)
- Number of Unplanned Admissions to ICU/ ITU/ HDU
- Scope of care decisions for example ‘Do Not Attempt Resuscitation’ or ‘Palliative care’ orders

### Structural Measures

#### Education/Training audit

- Audit of NEWS education/training and evaluation record
- Database of staff trained - each hospital to make their own local arrangement to best meet their needs

#### Key Performance Indicators (KPIs)

NEWS implementation is supported by National KPIs, which are reported quarterly to the Acute Business Information Unit (BIU), HSE. For KPI questions see Appendix 9.

### Audit Results

The audit results and reports should be discussed at the appropriate NEWS/EWS Governance group e.g. Deteriorating Patient Committee and findings fed upwards to the Hospital Clinical Governance Committee/ Hospital Senior Management Team and to all levels of staff where NEWS is used (as outlined in Recommendations 30 & 31, NCEC NCG No 1 NEWS (2020). The hospital’s healthcare audit/clinical audit cycle as part of the continuous quality improvement process should inform the audit plan.

Results and learning points can be used in the on-going education delivered by the designated NEWS Coordinator and in the local quality improvement initiatives. The chart completion audit results should facilitate learning discussions at handover, ward rounds or education sessions. Consideration should be given to reviewing a chart at multidisciplinary ward forums / safety huddles to identify good practice and opportunities for learning.

### Additional databases
As the tiered Response System evolves it is important for the hospital to progress to maintaining a database of patients escalated to, and seen by, the designated response team. The National Deteriorating Patient Recognition and Response Improvement Programme (DPIP) will support hospital sites in the development of a minimum dataset for the relevant database.

NQAIS Clinical is an online interactive application that analyses hospitals’ HIPE data and can provide detailed feedback to clinicians and managers. Hospitals can explore NQAIS Clinical to look at patient outcomes, for example, cardiopulmonary arrest and ICU length of stay.

NOCA Irish National ICU Audit (INICUA) is a quality and patient safety initiative that measures the quality of care in each ICU, benchmarking against international standards. Hospitals participating in this audit will have access to their data pertaining to unplanned admissions to ICU and collected information related to the patients NEWS score prior to admission.

The Sepsis Audit provides on-going feedback on the quality of care of patients with a diagnosis of sepsis to individual hospital sepsis committees and can provide information aligned to care of the clinically deteriorating patient.

2.13 Plan to update this National Clinical Guideline
The NEWS GDG agreed that the NEWS guideline should be reviewed on a three-yearly basis and updated in line with NCEC procedures. As a result NCG No. 1 (NEWS) (2020) will require updating in 2023 by the DPIP.
Section 3: National Clinical Guideline

3.1 Key questions and evidence statements

<table>
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<tr>
<th>Domain 1</th>
<th>Measurement and Documentation of Vital Signs and Other Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Review question 1</td>
<td>What EWSs and/or track and trigger systems are currently in use for the detection or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?</td>
</tr>
<tr>
<td>Review question 2</td>
<td>How effective are the different EWSs in terms of improving key patient outcomes in adult (non-pregnant) patients in acute health care settings?</td>
</tr>
</tbody>
</table>

Evidence Statement

In total, 123 studies conducted across 22 different countries were eligible for inclusion in the descriptive overview of Early Warning Systems (EWSs) in adult (non-pregnant) populations. The EWSs varied with 47 different named EWSs included (for example the NEWS, ViEWS, etc.), 13 unnamed EWSs, 23 studies which only included a single criterion for activating the emergency response system and two studies which did not provide details on the EWSs included. In addition, not only did the EWSs vary, but the number, type and frequency of measurement of vital sign parameters included varied with some studies having as little as two and one algorithm-based EWS including almost 400 parameters. The majority of the 79 studies, where it was reported, included digital rather than paper based EWSs and 44 studies did not report or it was not clear, what type of EWS it was. Importantly, the majority of the 123 studies did not report how often parameters were measured (n=83) which can effect performance of an EWS, and where they did, it varied from study to study. There were 71 studies which included one or more aggregated EWSs and the weighting varied across studies.

Overall, a large number of EWSs have been described in the literature. However these vary in many ways, making it difficult to compare the systems.
Review question 5 assessed the effectiveness of modified EWSs in specific sub-populations (frail elderly and patients with chronic respiratory conditions). Four observational cohort studies were eligible for inclusion. All four studies included patients with varying respiratory conditions including COPD or chronic hypoxaemia. The studies compared the predictive ability of modified EWSs including NEWS2, S-NEWS, CREWS and the Danish CROS to the NEWS. Modifications were largely in the SpO₂ weighting and cut-offs as this has been associated with excessive triggering and increased workload particularly in patients with chronic respiratory conditions. Overall however, the modified EWSs included were similar to the NEWS in predicting the primary outcomes of interest. Further largescale, prospective studies are warranted to validate the findings in this sub-population of patients with chronic respiratory conditions included in the four studies. These studies were all observational cohort studies with a greater risk of bias and confounding as a result. The certainty of the evidence was deemed to be very low.

In summary, review question 5 investigated whether modified EWSs (such as CREWS) could improve specificity and maintain sensitivity in specific sub-populations where NEWS has been shown to trigger false alarms. The NEWS is based on an EWS designed to maximise both sensitivity (the ability to detect patients at risk of dying) and specificity (the minimisation of false alarms) for unselected patients admitted to acute settings. The four included studies were found to be no better than NEWS in their ability to predict the outcomes of interest. Further research is warranted to validate the findings from these studies before the widespread adoption of modified EWSs.

The frequency of recording of vital signs was not reported in the majority of studies and where it was recorded it varied from study to study. Smith (2017) considered the optimum frequency of recording of vital signs in patients in acute hospitals as ‘an evidence-free zone’; research is required to determine optimum frequency of recording of vital signs.
Recommendation 1

NEWS is an adjunct to complement clinical judgement. It is designed to aid clinical decision-making. It does not replace clinician judgement.

Certainty of evidence: ⨁◯◯◯◯  Strength of Recommendation: Strong

Recommendation 2

Observations must be recorded and documented in the NEWS patient observation chart for all patients admitted to an acute hospital at the time of admission or initial assessment.

Certainty of evidence: ⨁◯◯◯◯  Strength of Recommendation: Strong

Recommendation 3

A full set of NEWS observations should be undertaken and documented on the NEWS chart when a patient transitions between areas within a hospital or on discharge from a higher level of care (HLOC) or Theatre Recovery Room and again on arrival to the ward.

Certainty of evidence: ⨁◯◯◯◯  Strength of Recommendation: Strong

Recommendation 4

The NEWS physiological observations are:

➢ Respiratory rate
➢ Oxygen saturation (SpO2)
➢ Heart rate
➢ Blood pressure
➢ Temperature
➢ Level of consciousness
   ○ ACVPU (C=new confusion)
➢ Room air or supplemental oxygen (a score of ‘3’ is added for ‘any O2’ as an uplift to NEWS score)

A full set of NEWS observations should be recorded on all occasions.

Certainty of evidence: ⨁◯◯◯◯  Strength of Recommendation: Strong
**Good Practice Points**

Local hospital policy must be adhered to in relation to the prescribing of supplemental oxygen.

Decisions may be made to document other observations and assessments depending on the patient’s clinical condition to further support timely recognition of deterioration. Examples of additional information that may be required include: fluid balance; Glasgow Coma Scale; pain; respiratory effort; pallor, capillary refill, sweating, nausea and vomiting; as well as additional biochemical and haematological analyses.

In the event that there are two failed attempts at achieving an digital blood pressure reading a manual recording of blood pressure should be undertaken.

A patient’s primary physician should document guidance to staff with regard to escalation and response when lying and standing blood pressure measurements are ordered.

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**Recommendation 5**

In the acute hospital setting the minimum standard for the assessment of observations is every six hours for the first 24 hours following admission and a minimum of every 12 hours monitoring thereafter if the patient’s clinical condition dictates. For every patient the frequency of monitoring of observations should be consistent with the clinical situation and history of the patient.

Certainty of evidence: ⡧◯◯◯  
Strength of Recommendation: Strong

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**Recommendation 6**

The NEWS Escalation & Response Protocol provides guidance on suggested frequency of monitoring of vital signs relevant to the patient’s NEWS score. The need for more or less frequent monitoring should be determined and documented by a competent clinical decision maker (senior doctor (Registrar or Consultant)/ Advanced Nurse Practitioner or senior nurse).

Certainty of evidence: ⡧◯◯◯  
Strength of Recommendation: Strong

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**Good Practice Points**

Frequency of observations for post-operative patients and patients on blood transfusions should follow local protocols.
Physiological Parameters and NEWS Scores (NEWSS)

The parameter ranges used in NEWS for each of the vital signs measured are those of the ViEWS system, an evidence-based early warning system which was developed and validated in the UK by Prytherch et al. in 2010. The NEWS score (NEWSS) is a product of the aggregated weight assigned to each individual vital sign. Thus, the NEWSS can also be considered to be evidence-based. For this reason it is never appropriate to adjust either the parameter ranges or a patient’s NEWSS. What MAY be adjusted is the medical response to an escalation of care triggered by a patient’s vital signs falling outside of normal parameter ranges giving a patient a NEWSS. This approach ensures that the individual circumstances of each patient can be considered and the response and escalation alert tailored appropriately according to the individual patient’s clinical condition based on the clinical judgement of the doctor. This individualised care is documented as a NEWS Escalation and Response Plan on the patient’s NEWS chart. The NEWS Escalation and Response Plan must include

➢ the rationale for the alteration
➢ a clear timeframe for review of the patient and the NEWS Escalation and Response Plan
➢ information about further actions and/or escalation of care.

Recommendation 7

A patient’s NEWS score or physiological parameter ranges must not be altered.

Certainty of evidence: ⬤⬤⬤⬤ Strength of Recommendation: Strong

Recommendation 8

The patient’s NEWS chart (hard copy and/or digital) should display physiological information in the form of a trend graph. The NEWS includes:

➢ A system for tracking changes in physiological parameters over time
➢ Thresholds for each physiological parameter or combination of parameters that may indicate possible deterioration in patient condition
➢ Information about the responses or action required as per the NEWS Escalation and Response protocol
➢ Information about the responses or action required as per Sepsis escalation protocol
➢ Documentation of NEWS Escalation and Response Plan
Good Practice Points

There is a clear distinction between continuous digital monitoring and an digital NEWS system, that is, where monitoring, recording and charting of vital signs and vital sign trends and triggering/alerting is done digitally.

When a patient is being monitored using digital technology in a ward setting, a full set of observations should be documented in the NEWS chart (digital or hard copy). In such circumstances consideration should be given to checking pulse and blood pressure manually on a regular basis.

Recommendation 9

There are patients for whom the routine recording of data for the NEWS may be inappropriate such as during end of life care where death is anticipated. In these circumstances, clinical teams may decide that modifications to the usual observations monitoring frequency and escalation protocol are appropriate. Such decisions should be discussed with the patient/family/carer and documented as a NEWS Escalation and Response Plan in the patient’s healthcare record.

Certainty of evidence: ⬜◯◯◯ Strength of Recommendation: Strong

The following are responsible for implementation of recommendations 1 - 9
Doctors, nurses, health and social care professionals, healthcare assistants.
Evidence Statement

A thematic analysis of the 18 studies included for this question was conducted; five interrelated themes emerged as both facilitators and barriers to escalation of care (Figure 2).

Figure 2: Facilitators and barriers to escalation of care

Clinical judgement, based on clinical experience and confidence was identified as both a facilitator and barrier to escalation of care. Where a staff member had clinical confidence in their own skills and ability and were able to recognise deterioration this was a facilitator of
escalation; conversely however clinical over-confidence was seen as a barrier to escalation where study participants over-estimated their clinical ability and disregarded the NEWS.

Participants reported fear of reprimand for activating the response system and fear of looking stupid to colleagues as being significant barriers to escalation. When there was a professional or positive response from response team members this encouraged staff to escalate care during subsequent events.

The NEWS was used as a means of negotiating professional and hierarchical boundaries in some studies where the NEWS provided a ‘license to escalate’. The NEWS was also seen to provide a bridge across professional boundaries as it facilitated communication and teamwork.

Clear protocols and policies for escalation and staff knowledge of these protocols facilitated escalation of care.

**NEWS Escalation and Response Protocol and NEWS Escalation and Response Plans**

It is never appropriate to adjust either physiological parameter ranges or a patient’s NEWS score. What MAY be modified is the medical escalation and/or response to an escalation of care triggered by a patient’s vital signs falling outside of normal parameter ranges thus producing a NEWS score.

**Recommendation 10**
The NEWS Escalation & Response Protocol should be followed in the event of any NEWS trigger.

Certainty of evidence: ⬜️⬜️⬜️⬜️  
Strength of Recommendation: Strong

**Recommendation 11**
A senior nurse, using his or her clinical judgement, may decide against immediate escalation as outlined in the NEWS Escalation & Response Protocol when he/she believes that immediate simple measures are likely to reduce the NEWS score over a short period of observation, typically less than 30 minutes. The rationale for the decision not to escalate care should be explicitly documented in the patient’s healthcare record.

Certainty of evidence: ⬜️⬜️⬜️⬜️  
Strength of Recommendation: Strong

**Good Practice Points**
There is a readily identifiable cause for NEWS score that can be addressed
❖ The decision not to escalate must be made in conjunction with Nurse in Charge (NIC)
❖ The rationale for the decision not to escalate is explicitly documented as a NEWS Escalation and Response Plan within the patient’s healthcare record
❖ The patient is reassessed by the nurse and a full set of NEWS observations recorded within an agreed review timeframe and follow-on actions determined.

**Recommendation 12**
In a case where sepsis is suspected the Sepsis Clinical Decision Support Tool should be used for the identification, escalation and response to sepsis.

Certainty of evidence: ◊◊◊◊◊ Strength of Recommendation: Strong

**Recommendation 13**
The NEWS Escalation & Response Protocol allows for the capacity to escalate care based only on the concern of the clinical staff member at the bedside in the absence of other documented abnormal physiological measurements (‘staff member worried’ criterion).

Certainty of evidence: ◊◊◊◊◊ Strength of Recommendation: Strong

**Recommendation 14**
Patient, family or carer concern is an important indicator for patient deterioration. The NEWS Escalation and Response Protocol allows for the concerns of the patient, family or carer to trigger clinical review.

Certainty of evidence: ◊◊◊◊◊ Strength of Recommendation: Strong

**Recommendation 15**
The needs and wishes of patients where treatment-limiting decisions (ceilings of care) have been made and documented should be considered when escalating care.

Certainty of evidence: ◊◊◊◊◊ Strength of Recommendation: Strong

**Good practice point**
The use of situation awareness to anticipate deterioration is recommended. Situation awareness criteria include but are not exclusive to the following:

- Clinician “gut-feeling” that the patient is at risk for deterioration
Brady et al. (2013) define situation awareness as ‘knowing what is going on’. Situation awareness is a key tenet of high reliability organisations (HROs) such as nuclear power and commercial aviation. HROs deal with constant and catastrophic risk yet maintain exemplary safety records. Brady et al. (2013 p. e299) go on to say that situation awareness (SA) exists at three levels:

- The perception of elements in the environment within a volume of time and space
- The comprehension of their meaning
- And the projection of their status in the near future.

Ineffective clinical monitoring is thought to be the result of a lack of situation awareness.
**Domain 3  |  Response Systems**

Review question 2 | How effective are the different EWSs in terms of improving key patient outcomes in adult (non-pregnant) patients in acute health care settings?

**Evidence statement**

Thirty-two studies in total were included in this part of the HRB-CICER literature review investigating the effectiveness of emergency response systems (efferent limb) on patient outcomes and resource utilisation. The certainty of the evidence overall was deemed to be very low across all the studies. The lack of high quality evidence to evaluate the effect of EWS interventions on patient outcomes was due to a number of factors. These factors included a wide variation in the EWS interventions used (for example for the emergency response systems interventions team composition varied, parameters to activate the emergency response team varied and operating times varied from study to study); the definition of the outcomes varied across studies (for example mortality, which was reported as simply ‘death’, in-hospital mortality, unexpected death and mortality at three months); populations included varied and there were small sample sizes and low event rates in some studies. All of these added significant heterogeneity to the review findings.

**Recommendation 16a**

For the first 24 hours following admission the frequency of observations and the predetermined NEWS Escalation and Response Protocol should not be altered.

Certainty of evidence: ⨁◯◯◯   Strength of Recommendation: Strong

**Recommendation 16b**

After 24 hours a senior medical doctor can modify the predetermined NEWS Escalation and Response Protocol based on a patient’s baseline, observations trend, clinical risk factors and NEWS score and document these modifications as a NEWS Escalation and Response Plan.

Certainty of evidence: ⨁◯◯◯   Strength of Recommendation: Strong
### Recommendation 17
The NEWS Escalation and Response Plan should be reviewed by a Registrar or Consultant doctor every 24 hours.

Certainty of evidence: ⬤⬤⬤⬤ Strength of Recommendation: Strong

### Recommendation 18
A NEWS Escalation and Response Plan will include at a minimum:
- Rationale for modification of escalation and response
- Timeframe for review of patient and response plan (minimum 24 hourly review)
- Information about further action(s) and/or escalation

Certainty of evidence: ⬤⬤⬤⬤ Strength of Recommendation: Strong

### Recommendation 19
A tiered response model is recommended. A tiered response model will encompass the following elements:

- Bedside response (NEWS scores of 0-2): nurse-led, ward-based response
- Urgent response (NEWS scores of 3-6): response by a clinician or team with competence in the assessment and treatment of acutely ill patients e.g. Advanced Nurse Practitioner service. An urgent response can be called for scores of 0-2 if there is clinician concern.
- Emergency response (NEWS scores of ≥7): as above in addition to staff with critical care competencies and diagnostic skills

Escalation should occur for any patient with a score of 3 in any single parameter.

Certainty of evidence: ⬤⬤⬤⬤ Strength of Recommendation: Conditional

### Good Practice Point
The NEWS (2020) NCG No. 1 advocates a move towards an anticipatory model of care. An anticipatory care approach acknowledges the vulnerability of patients at low and sometimes ‘no’ NEWS scores. It involves the earlier recognition of the potential for patient deterioration through the use of clinical judgement, situation awareness and an appropriate response model. A tiered response model allows for the clinician at the bedside to escalate care regardless of the patient’s NEWS score. The 3-tiered response model outlined in Recommendation 19 will take some years to achieve nationally.

While NEWS (2020) recommends escalation of care for any patient with a score of 3 in any single parameter evidence suggests that a patient with an aggregate score of 3, for example
a NEWS score of 3 comprising 1+1+1 or 2+1, are likely to be sicker and with more potential for deterioration (Jarvis et al. 2015).

The nature of the response system and the skill-set of the responding team needs to be appropriate to the size, role, resources and patient profile of the hospital.

**Recommendation 20**
The Executive Management Team/Board in each hospital should agree and document their standardised local tiered response model.

Certainty of evidence: ⨁◯◯◯◯  
Strength of Recommendation: Strong

**Recommendation 21**
Clinical staff responding to the deteriorating patient should:

- Be available to respond within agreed timeframes
- Be able to assess a patient and provide a provisional diagnosis
- Be able to undertake appropriate initial therapeutic intervention
- Be able to stabilise and maintain a patient pending decisions on further management
- Have authority to make transfer decisions and to access other care providers to deliver definitive care
- As part of the Emergency Response tier there should be access at all times to at least one clinician who can practice advanced life support e.g. ACLS certified
- In cases where patients need to be transferred to another acute hospital to receive emergency care, appropriate care needs to be provided until such assistance is available as per local policy

Certainty of evidence: ⨁◯◯◯◯  
Strength of Recommendation: Strong

**Recommendation 22**
Events surrounding a call for assistance (time of call, response, plan of care and outcome) should be documented in the healthcare record. Records should be suitable for audit purposes as part of on-going quality improvement processes.

Certainty of evidence: ⨁◯◯◯◯  
Strength of Recommendation: Strong
Recommendation 23

Clinicians providing response assistance should communicate with the primary medical practitioner or team in an acute hospital about the call for assistance, the response, the outcome and the future plan of care.

Certainty of evidence: ⬤⬤⬤⬤ Strength of Recommendation: Strong

Good Practice Points

Treatment-limiting decisions should be made by the primary medical practitioner/team in conjunction with the patient and family prior to the occurrence of an urgent or emergency event where possible.

Clinicians providing urgent and/or emergency assistance should have access to medical staff members who can make treatment-limiting decisions. Where possible these decisions should be made with input from the patient, family and the primary medical practitioner or team or deputising team.
Evidence Statement

In a review of serious incident investigation reports Mullen (2013) identified communication between clinical specialties as problematic with communication of unexpected clinically significant or urgent findings relating to the deteriorating patient highlighted as warranting particular attention.

A systematic evaluation of the quality of reports of serious incident investigations in Irish hospitals identified problems with both individual and team communication as causal factors leading to death or serious harm (McCaughan 2016).

The 2017/2018 Quality Assurance & Verification (QAV, HSE) healthcare audit of NEWS guideline implementation in nine acute hospitals in Ireland (73 healthcare records) found that evidence pertaining to the use of the communication tool ISBAR was rare when communicating information about the deteriorating patient.

Focus groups held in 2018 and 2019 with nurses, doctors and health and social care professionals working in acute hospitals in Ireland found that while participants liked the structure provided by the ISBAR tool for communicating verbally with senior personnel documentation using ISBAR was rarely done. ISBAR was more likely to be used as a mental model for communication rather than a documentation tool.

Recommendation 24
The ISBAR clinical communication tool should be used when communicating information verbally and in writing between healthcare professionals. Where a patient’s condition and/or a situation is deemed to be critical, this should be clearly stated at the outset of the conversation.

Certainty of evidence: ⬤⬤⬤⬤⬤ Strength of Recommendation: Strong

Recommendation 25
Safety huddles should be used as forums where staff/patient/family concerns can be raised and discussed. The use of visual management tools should be considered to enhance interprofessional communication.

Certainty of evidence: ⬤⬤⬤⬤⬤ Strength of Recommendation: Strong
Recommendation 26
Following clinical review in response to an escalated NEWS a plan of care should be clearly documented and verbally communicated.

If...
A senior doctor determines that modification to the predetermined NEWS Escalation and Response Protocol is required a NEWS Escalation and Response Plan should be clearly documented and verbally communicated.

Certainty of evidence: ☐☐☐☐ ☒Strength of Recommendation: Strong

Recommendation 27
Information about deterioration should be communicated to the patient, family or carer in a timely and ongoing way, and documented in the healthcare record in keeping with patient consent and confidentiality.

Certainty of evidence: ☐☐☐☐ Strength of Recommendation: Strong

Good Practice Points
Refer to relevant National Clinical Guidelines:
❖ No.5 Communication (Clinical Handover) in Maternity Services
❖ No. 6 Sepsis
❖ No. 11 Communication (Clinical Handover) in Acute and Children’s Hospital Services

NCHD focus group participants advised that they use ISBAR as a mental model for structuring communication and found it useful and would like to see a similar system/structure used for documentation in HCRs.

An ISBAR sticker is in use in some hospitals to aid documentation. However, adoption of this practice, while useful, has been found to be variable. Sustained implementation of such an initiative requires a structured QI approach.
<table>
<thead>
<tr>
<th><strong>Domain 5</strong></th>
<th><strong>Leadership &amp; Governance</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Review question 1</strong></td>
<td>What EWSs and/or track and trigger systems are currently in use for the detection or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?</td>
</tr>
<tr>
<td><strong>Review question 2</strong></td>
<td>How effective are the different EWSs in terms of improving key patient outcomes in adult (non-pregnant) patients in acute health care settings?</td>
</tr>
<tr>
<td><strong>Review question 5</strong></td>
<td>Why do healthcare professionals fail to escalate as per the NEWS protocol?</td>
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</table>

**Evidence Statement**

Success and sustainability of the National Early Warning System (NEWS) requires executive and clinical leadership, and structured organisational governance. There is limited evidence in the published literature on governance of early warning systems. However, a finding for review Question 5 was that governance was identified as both a facilitator and a barrier to escalation of care.

Three sub-themes of governance - ‘Accountability’, ‘Standardisation’ and ‘Resources’ – were identified as facilitators of escalation. Accountability was a motivating factor in four studies, whereby staff activated the response team in case something went wrong. In this respect, the response team was viewed as a safety net by the nurses and they valued the extra support it provided.

In addition, ‘standardisation’ was reported in seven studies, where clear policies or protocols for action and participant knowledge of these policies or protocols for escalation was a key facilitator of escalation. A clear outline of when to call and who to call, that was communicated to and understood by all staff members, was a facilitator of escalation.

Resources (that is, sufficient staffing levels and good communication such as use of handover tools) was a key facilitator of escalation in seven studies.

Conversely, the same three sub-themes of governance - Standardisation, Resources and Lack of accountability – were also identified as barriers to escalation of care.
‘Standardisation’ was an issue reported in twelve studies. Standardisation included a lack of clear policies or protocols for action and this led to inaction or confusion amongst staff as to who to call or when. In addition to a lack of clear policies or protocols, ‘standardisation’ included a lack of knowledge of policies or protocols by staff. Where staff were not familiar with the correct protocol for escalation this was a barrier to escalation. Lack of education or training was reported by participants with no standardised, or regular training in place.

‘Resources’ were reported as barriers whereby staffing shortages, particularly in conducting the required monitoring of patients, poor communication systems/protocols and the perceived workload of the response team were all reported as barriers to escalation.

‘Lack of accountability’ and a blame culture was a reported sub-theme. For example, junior staff described situations where a patient deteriorated and they informed senior staff, but the senior staff did not escalate care, and then when the patient collapsed or deteriorated the blame was put on the junior staff member. This lack of accountability of senior staff was a barrier to these staff in raising concerns about deterioration.

**Recommendation 28**

Hospital management should appoint a Consultant lead and executive sponsor at senior management level with overall accountability for the ongoing performance and improvement of the NEWS system.

Certainty of evidence: ★★★★ Strength of Recommendation: Strong

**Recommendation 29**

A formal hospital-level governance committee should be established in each hospital which has direct access to the Hospital Clinical Governance Committee. Where possible this forum should seek to align governance for sepsis, cardiac arrest, resuscitation, NEWS, PEWS, IMEWS, EMEWS, Mortality & Morbidity, ICU admissions and discharges etc.

Certainty of evidence: ★★★★ Strength of Recommendation: Strong

**Recommendation 30**

The Governance Committee should oversee the ongoing performance and improvement of the anticipation, recognition, escalation, response and evaluation elements of the system locally. It should:

- Have appropriate responsibilities delegated to it and be accountable for its decisions and actions.
- Monitor the effectiveness of interventions and education.
- Have a role in reviewing clinical outcome data, and healthcare audits.
- Provide advice about the allocation and prioritisation of resources.
- Include service users, clinicians, managers and executives
- Develop quality improvement plans and report on progress
**Certainty of evidence: ⬤⬤⬤⬤**  
**Strength of Recommendation: Strong**

**Recommendation 31**
A formal guideline/policy framework for the implementation of the NEWS NCG No. 1 should be in place and include issues such as:

- Governance arrangements.
- Roles and responsibilities.
- Communication processes.
- Safety huddles.
- Resources for the Response System, such as staff and equipment.
- Education and training requirements.
- Evaluation, audit and feedback processes.
- Arrangements with external organisations that may be part of a response system.
- Documentation regulation and management of records.
- Patient and service user involvement.

Local planned variations to the NEWS Escalation and Response Protocol that might exist in different circumstances (such as for different times of day or at night) should be identified and documented.

**Certainty of evidence: ⬤⬤⬤⬤**  
**Strength of Recommendation: Strong**

**Recommendation 32**
There should be appropriate policies and documentation regarding ‘Do Not Attempt Resuscitation’ decisions; treatment-limiting decisions (ceilings of care); and end-of-life decision making as they are critical in ensuring that the care delivered in response to deterioration is consistent with appropriate clinical practice and the patient’s expressed wishes.

**Certainty of evidence: ⬤⬤⬤⬤**  
**Strength of Recommendation: Strong**

**Recommendation 33**
Hospitals should support additional safety practices that enhance the NEWS. Incorporating briefings, safety pauses and huddles into practice can lead to greater situation awareness amongst clinicians and multi-disciplinary teams.

**Certainty of evidence: ⬤⬤⬤⬤**  
**Strength of Recommendation: Strong**

**Good Practice Points**

The local clinical lead and NEWS co-ordinator should have designated protected time for NEWS implementation and audit.

Shared learning and a need for quality improvement capability will be required by all early
warning system and safety intervention teams. Collaboratives between hospitals should be considered.

Interventions and safety supports such as the huddle and situation awareness as developed in Cincinnati Children’s Hospital should be implemented.

Hospital policy on Advance Directives should be adhered to.
Review question 3
What education programmes have been established to train HCPs relating to the implementation of EWSs or track and trigger systems for the detection of or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?

Evidence Statement
The systematic review update of the effectiveness of educational interventions to improve the detection of physiological deterioration in adult (non-pregnant) patients in acute health care settings included 23 studies. Evidence from the review suggests that educational interventions (including mannequin- or virtual-based simulation, validated programmes such as COMPASS® or FIRST²ACT, or hospital specific programmes) succeed in increasing health care staff (predominantly nursing staff) knowledge, clinical performance and self-confidence to recognise and manage a deteriorating patient, at least in the short term. The evidence also shows improvements in the documentation of vital signs and the use of EWS post-educational intervention, but was mixed for the effect on patient outcomes including ICU admission, length of stay and cardiac arrest. Communication (through the use of standardised tools such as ISBAR, SBAR and ABCDE) between nurses and doctors in relaying information about a deteriorating patient, and escalation of care, improved post-training in the majority of the 23 studies in the short term at least (i.e. immediately post-intervention).

Studies included which looked at educational interventions and their effect on health care staff in improving the detection and management of physiological deterioration in adult patients in acute settings were of poor quality overall. However, educational interventions typically resulted in a short term improvement in knowledge, clinical performance, self-confidence, documentation of vital signs and nurse-physician communication.

Certainty of evidence: ⬤⬤⬤⬤ Strength of Recommendation: Strong

Recommendation 34
Clinical staff in all acute hospitals should complete NEWS education and training and maintain their knowledge and skills in NEWS. On induction to an organisation all medical, nursing and therapies staff should become familiar with a hospital’s NEWS Escalation and Response Protocol.

Certainty of evidence: ⬤⬤⬤⬤ Strength of Recommendation: Strong

Recommendation 35
Education and training on the use of the NEWS system should form part of undergraduate curricula in nursing, medical and health and social care professionals’ programmes. The Department of Health/National Patient Safety Office and the Health Service Executive should work with academic partners to ensure that students have undertaken NEWS training prior to undertaking clinical placements.

Certainty of evidence: ⬠◯◯◯ Stress of Recommendation: Strong

Recommendation 36
As response teams evolve consideration should be given to the development of education and training programmes focusing on relevant competencies and skills.

Certainty of evidence: ⬠◯◯◯ Stress of Recommendation: Strong

Good Practice Points
All opportunities should be taken by the clinicians providing urgent and emergency assistance to use the call as an educational opportunity for ward staff and pre-registration nursing, medical and therapies students.

The NEWS Escalation and Response protocol should be included in education programmes.

Education programme learning outcomes can be seen in Table 5.
Following NEWS education and training **nursing staff** should be able to:

1. Understand and operationalise the NEWS system and the NEWS protocol for escalation of care
2. Understand the concept of anticipatory care and use of situation awareness as guidance
3. Understand the importance of measuring and documenting all core physiological parameters
4. Communicate information about clinical deterioration using ISBAR
5. Systematically assess a patient and recognize patient/family/carer concerns
6. Understand and interpret normal and abnormal physiological parameters and other abnormal observations
7. Initiate appropriate early interventions for patients who are deteriorating
8. Communicate information about clinical deterioration to patients, families and carers
9. Understand the importance of, and their role in, end-of-life care planning with the medical team and patient, family or carers

Following NEWS education and training **medical staff** should be able to:

1. Understand and operationalise the NEWS system and the NEWS protocol for escalation of care
2. Understand the concept of anticipatory care and use of situation awareness as guidance
3. Understand the relevance of the burden of illness in terms of frailty, co-morbidities, immunosuppression and disability.
4. Communicate information about clinical deterioration using NEWS and ISBAR
5. Systematically assess a patient and recognize patient/family/carer concerns
6. Understand and interpret normal and abnormal physiological parameters and other abnormal observations
7. Initiate appropriate early interventions for patients who are deteriorating
8. Communicate information about clinical deterioration to patients, families and carers and members of the clinical team
9. Understand the importance of, and discuss end-of-life care planning with the healthcare team and patient, family or carers
10. Understand the importance of developing and documenting an individualised active management plan following review
11. Understand the importance of organising appropriate patient follow-up

Following NEWS education and training **HSCP staff** should be able to:

1. Understand and operationalise the NEWS system and the NEWS protocol for escalation of care
2. Understand the concept of anticipatory care and use of situation awareness as guidance
3. Understand the importance of measuring and documenting all core physiological parameters
4. Communicate information about clinical deterioration using ISBAR
5. Systematically assess a patient and recognize patient/family/carer concerns
6. Understand and interpret normal and abnormal physiological parameters and other abnormal observations
7. Initiate appropriate early interventions for patients who are deteriorating
8. Communicate information about clinical deterioration to patients, families and carers
9. Understand the importance of, and discuss end-of-life care planning with the medical team and patient, family or carers

Following NEWS education and training **Healthcare Assistants** should be able to:

1. Understand and operationalise the NEWS system
2. Understand the importance of measuring and documenting all core physiological parameters
3. Recognise when vital signs are abnormal and report to designated nurse as per escalation protocol
4. Understand and operationalise the NEWS protocol for escalation of care
5. Listen to patient/family/carer concerns and report appropriately
**Evidence Statement**

A systematic review of the literature conducted by HRB-CICER (2018) to underpin the updating of the Irish Maternity Early Warning System (IMEWS) V2 (2019) identified 61 audits of early warning systems in all populations, 28 of which were conducted in the general adult population. The systematic review did not identify a standard set of audit criteria. Similar rates of inadequate compliance with early warning systems and with documentation and escalation policies were reported across audits of all populations. All audits suggested regular audit as a mechanism to increase compliance.

A healthcare audit of compliance with selected recommendations of the National Early Warning System (NEWS) (2013) was undertaken in nine acute hospitals in Ireland by the Quality Assurance & Verification (QAV) Division in 2017/2018. Findings from the audit follow.

Based on the 73 healthcare records (HCRs) reviewed, the audit team found evidence of the practice of parameter adjustment which, while not defined in the NCG, was defined in eight of the nine NEWS hospital policies. While the eight hospital policies emphasised the importance of a clearly documented management plan with agreed parameters for review, the audit team found no evidence of such plans documented in the HCRs reviewed.

Limited assurance can be provided that eight of the nine hospitals were compliant with the NCG on NEWS.

Non-compliance was found in relation to the following:

- Recording, scoring and totalling of the seven patient observations on the NEWS chart in three of the eight hospitals audited
- The use of the formal communication protocol (ISBAR) at all hospitals
- The provision of evidence of training on the NEWS/COMPASS© and certificates of completion in one hospital
- Service user involvement in the implementation of the NCG had not taken place in any of the nine hospitals audited.

Limited compliance was found in relation to the following:

- Recording, scoring and totalling of the seven patient observations on the NEWS chart in two of the eight hospitals audited
- Adherence to the escalation protocol for patients showing signs of deterioration at all hospitals
➢ The provision of evidence of training on the NEWS/COMPASS© and certificates of completion at five hospitals.

Compliance was found in relation to the following:

➢ Recording, scoring and totalling of the seven patient observations on the NEWS chart in three of the eight hospitals audited
➢ The provision of evidence of training on the NEWS/COMPASS© and certificates of completion in two hospitals
➢ Completion of nursing process audits on the NEWS observations using TYC at all nine hospitals.
➢ Local in-house audits had also been completed at the majority of hospitals by the NPDU and medical students had assisted with audit at one site.

The resources available for the response systems varied from hospital to hospital. The audit team found that some hospitals had a response team in place. At other hospitals there was a dedicated NEWS bleep. In two hospitals the cardiac arrest team/medical emergency team responded to patient deterioration and elevated EWS.

The audit team noted that medical and nursing documentation frequently fell short of the standard required to demonstrate adherence to the escalation protocol in all sites audited.

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<tr>
<th>Recommendation 37</th>
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<tr>
<td>Clinical and healthcare audit data should be collected and reviewed locally by interprofessional teams to inform improvement and patient outcomes.</td>
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<tr>
<td>Certainty of evidence: ⬤⬤⬤⬤</td>
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<tr>
<th>Recommendation 38</th>
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<tbody>
<tr>
<td>All audits should be reviewed by the relevant governance committee and findings escalated upwards to the Hospital Clinical Governance Committee/Hospital Senior Management Team and to all levels of staff where NEWS is used.</td>
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<td>Certainty of evidence: ⬤⬤⬤⬤</td>
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<th>Recommendation 39</th>
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<tr>
<td>NEWS implementation and sustainability should form part of the hospitals patient safety and quality improvement strategy. It should be supported through the application of quality improvement methods, such as engagement strategies, testing and measurement to ensure successful implementation, sustainability and future progress.</td>
</tr>
<tr>
<td>Certainty of evidence: ⬤⬤⬤⬤</td>
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Evidence Statement

Early Warning Systems (EWSs) are evolving internationally. There is a clear move internationally towards digital EWSs as they are known to be a more effective and efficient means of tracking patient observation trends, calculating EWS scores and triggering alerts for escalation of care. As the NEWS evolves in Ireland it will be essential that the system is aligned to relevant developments such as the planned future introduction of the digital patient health record.

A Health Technology Assessment (HTA) conducted by HIQA in 2015 on the use of information technology for early warning and clinical handover systems evaluated the resources that would be required to introduce a digital EWS in an Irish hospital (530-bed) setting. The HTA concluded there is some evidence that the implementation of digital EWSs contribute to reduced mortality rates and a change in general and ICU LOS (which varied from a minimal relative reduction up to 40.3% and 76% reductions, respectively). Improved efficiency and accuracy of recording vital sign parameters, compliance with escalation protocols and significant user (clinician) satisfaction were also reported. However, as the quality of the included studies of effectiveness was variable and the interventions performed in a range of healthcare jurisdictions with a variety of outcomes measured, the ability to generalise the findings to the Irish healthcare context may be limited.

In a more recent small study in an Irish sample the introduction of a digital NEWS resulted in reduction in errors of recording of vital signs, reduction in errors when calculating NEWS scores and an increase of appropriate escalations of care.

Recommendation 40
National and local health service organisations should seek opportunities to align their systems to support best practice and maximise patient safety. For example, aligning systems for end-of-life care with NEWS will help to ensure co-ordinated and effective care for patients whose condition is irreversibly deteriorating.

Certainty of evidence: ⬤⬤⬤⬤⬤ Strength of Recommendation: Strong

Recommendation 41
A move towards a digital NEWS should be incorporated into service planning and development. These systems should enhance patient safety care processes and clinician/patient interaction.

Certainty of evidence: ⬤⬤⬤⬤⬤ Strength of Recommendation: Strong
**Good Practice Points**

Other clinical assessment tools to aid clinical decision-making should be considered in conjunction with NEWS where appropriate for example:

- Clinical burden of frailty is measured by Dalhousie or Rockwood Clinical Frailty Scale
- Clinical burden of disability is measured by the Barthel Index
- Clinical burden of impaired immune response - risk stratification tool
- Clinical burden of co-morbidity is measured by the Charlson Co-Morbidity Index
3.2 Summary budget impact analysis

Provide a budget impact analysis (BIA) summary, and refer the reader to the full economic assessment in the appendices. The recommended structure for your one page summary is to use the following subheadings:

**To be completed in collaboration with HRB-CICER**
Section 4: Appendices

Appendix 1a: Guideline Development Group Terms of Reference

GDG Terms of Reference
NEWS (2013) NCG No.1 Guideline Development Group
Terms of Reference (agreed 31st January 2018)

1. Purpose
The purpose of this Guideline Development Group (GDG) is to update the existing NCG No.1 (NEWS) (2013) to reflect current best evidence.

2. Objectives
The objectives of the GDG are to:
➢ Ensure adherence to the NCEC methodology in drafting the revised clinical guideline
➢ Include a budget impact analysis in the updated guideline
➢ Translate evidence from the HRB-CICER literature review to guideline recommendations and best practice points
➢ Include an improvement strategy in the revised guideline
➢ Prepare a draft updated guideline
➢ Circulate draft guideline for consultation and external review
➢ Finalise and approve the updated clinical guideline
➢ Submit to National EWS Steering Group for review and approval
➢ Submit finalised updated guideline to NPSO/NCEC, DOH for approval, endorsement and ministerial launch

3. Scope
The scope of the GDG is to revise and update the existing NCG No.1 (NEWS) (2013) to reflect an early warning system rather than score for adult non-pregnant patients in the acute hospital setting. An Early Warning System addresses all aspects of the recognition and response to the deteriorating patient, from recognition of clinical deterioration at the bedside to the clinical and organisational response to deterioration and escalation. The GDG will be cognisant of this throughout the guideline revision process in particular when developing guideline recommendations.

4. Working Arrangements
   a) A schedule of meetings will be agreed with the Chair for the year. Work will be undertaken between meetings and members will contribute to, and approve work, via e-mail correspondence (and teleconference when available).
b) The Chair and Deputy Chair will be responsible for circulating papers and minutes of meetings. Papers for meetings will be circulated no later than 3 working days before meetings and minutes will be circulated no later than 2 weeks after meetings.

c) The group will be quorate if a third of total membership (8) are present.

d) Apologies should be sent in advance of meetings. If a group member does not attend more than three consecutive meetings the Chair or Deputy Chair will contact him/her to seek confirmation of continued participation or if they would like to nominate a replacement.

e) Members of the GDG will be accountable to the specialist groups and individual organisations they represent and will report through the relevant organisation’s governance structures.

f) Decision-making: the agenda will identify items that require important decisions to be made at the meeting. Where group members are unable to attend they may submit comments to the Deputy Chair, by e-mail, by 5pm on the day prior to the meeting. The Deputy Chair will bring forward all comments received for consideration by the group in attendance. Decisions will be made by the group attending the meeting. Meeting notes will detail such decisions to group members who are not in attendance.

h) GDG members may be required to participate in educational workshops relevant to guideline development work at various stages throughout the guideline development process

**NEWS GDG member Roles and Responsibilities**

**Note:** As the guideline review process evolved and the magnitude of the work became apparent the Chair and Deputy Chair roles were reconfigured to Co-Chair roles.

**GDG Chairperson/Deputy Chairperson Role and Responsibility**

- Develop and agree terms of reference
- Ensure guideline is developed using NCEC methodology and that each stage of the stages of the clinical guideline path are addressed
- Set and agree timelines (using a standard project management approach where possible)
- Set and circulate the agenda of each meeting to members
- Encourage broad participation from members in discussion
- Identify and assign tasks
- Agree a process for dealing with conflicts of interest
Identify and oversee the progress of specific sub-groups
End each meeting with a summary of decisions and actions
Act as a point of contact for GDG members

**GDG Member Roles and Responsibilities**
- Review and agree group membership to reflect all key stakeholders
- Agree timelines for meetings and the clinical guideline development process
- Convene as required
- Give consideration to each of the stages of the clinical guideline path
- Review existing policies, guidelines, national and international evidence of best practice, relevant scientific and clinical expert opinion pertaining to the clinical guideline area
- Determine whether to adapt, adopt or develop a new clinical guideline
- Draft clinical guideline using NCEC methodology
- Consult with relevant interested parties and the public
- Review and incorporate feedback from consultation process as appropriate
- Finalise and approve clinical guideline for submission to Steering Group

**GDG Service user Roles and Responsibilities (in addition to above)**
- Ensure that key questions are informed by issues that matter to the service user
- Identify outcome measures they think are important for each key question
- Assist the GDG with the collection of service user views e.g. by helping to prepare questions for focus groups
- Help the GDG with consultation arrangements
- Identify areas where service users’ preferences and choices may need to be acknowledged in the clinical guideline
- Help write the information for the service users section of the clinical guideline including identifying sources of further information
- Help ensure that the clinical guideline is clearly and sensitively worded

*List of GDG members can be seen in Table 1, page 3.*
# Appendix 1b: National Deteriorating Patient Recognition and Response Improvement Programme (DPIP) Steering Group

<table>
<thead>
<tr>
<th>Name</th>
<th>Discipline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avilene Casey (Chair)</td>
<td>National Lead, Deteriorating Patient Recognition and Response Improvement Programme (DPIP)</td>
</tr>
<tr>
<td>Miriam Bell</td>
<td>Project Lead, EWS Guideline Revision, DPIP</td>
</tr>
<tr>
<td>Fiona McDaid</td>
<td>Nurse Lead, National Emergency Medicine Programme</td>
</tr>
<tr>
<td>Louise Hendrick</td>
<td>NCHD Representative</td>
</tr>
<tr>
<td>Cora McGaughan</td>
<td>Assistant National Director Healthcare Audit Quality Assurance &amp; Verification Division</td>
</tr>
<tr>
<td>Richard Walsh</td>
<td>Director of Nursing, National Acute Medicine Programme</td>
</tr>
<tr>
<td>Philip Crowley</td>
<td>National Director Quality Improvement Division</td>
</tr>
<tr>
<td>Colm Henry</td>
<td>National Clinical Advisor and Group Lead, Acute Hospitals Division</td>
</tr>
<tr>
<td>Elaine Browne</td>
<td>Project Manager Office of National Clinical Advisor and Group Lead Acute hospitals Division</td>
</tr>
<tr>
<td>Sinead Horgan</td>
<td>ADON Sepsis, S/SWHG</td>
</tr>
<tr>
<td>Ronan O’Cathasaigh</td>
<td>RTO, Mayo General Hospital</td>
</tr>
<tr>
<td>Dorothy Breen</td>
<td>Consultant Anaesthetist, CUH</td>
</tr>
<tr>
<td>Mary Brosnan</td>
<td>Director of Midwifery, National Maternity Hospital, Holles Street</td>
</tr>
<tr>
<td>Derek Cribben</td>
<td>Nurse Lead, National Critical Care Programme</td>
</tr>
<tr>
<td>Paul Ridgeway</td>
<td>Consultant Surgeon, AMNCH</td>
</tr>
<tr>
<td>Gerard McCarthy</td>
<td>Clinical Lead, National Emergency Medicine Programme</td>
</tr>
<tr>
<td>David Vaughan</td>
<td>Director of Quality &amp; Patient Safety, Children’s Hospital Group</td>
</tr>
<tr>
<td>Jean Kelly</td>
<td>Chief Director of Nursing &amp; Midwifery, Saolta University Healthcare Group</td>
</tr>
<tr>
<td>John Fitzsimons</td>
<td>Consultant Paediatrician, OLOL, Drogheda and Clinical Lead NCP Paediatrics</td>
</tr>
<tr>
<td>Andrea McGrail</td>
<td>Director of Nursing &amp; Midwifery Mayo General Hospital</td>
</tr>
<tr>
<td>Christina Doyle Ciara Hughes</td>
<td>Programme Manager, Sepsis Programme (to April 2019)</td>
</tr>
<tr>
<td>Name</td>
<td>Position and Details</td>
</tr>
<tr>
<td>-----------------------</td>
<td>---------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Damien Douglas</td>
<td>Patient Representative</td>
</tr>
<tr>
<td>Moira Skelly</td>
<td>Patient Representative</td>
</tr>
<tr>
<td>Rosemary Kratschmar</td>
<td>Patient Representative</td>
</tr>
<tr>
<td>Maria Donnelly</td>
<td>Consultant Anaesthetist, AMNCH, Tallaght</td>
</tr>
<tr>
<td>Peter O’Toole</td>
<td>Advanced Nurse Practitioner National Clinical Programme for COPD</td>
</tr>
<tr>
<td>Gareth Clifford</td>
<td>Quality &amp; Patient Safety, Acute Hospitals Division</td>
</tr>
<tr>
<td>Fergal Hickey</td>
<td>Consultant Emergency Medicine Sligo General Hospital</td>
</tr>
<tr>
<td>Professor Garry Courtney</td>
<td>Clinical Lead National Acute Medicine Programme</td>
</tr>
<tr>
<td>Jamie Logan</td>
<td>Nurse Lead National Clinical Programme in Surgery</td>
</tr>
<tr>
<td>Karen Power</td>
<td>National Project Manager Irish Maternity Early Warning System</td>
</tr>
<tr>
<td>Michael Power</td>
<td>Clinical Lead National Critical Care Programme</td>
</tr>
<tr>
<td>Vida Hamilton</td>
<td>Clinical Lead National Sepsis Programme</td>
</tr>
<tr>
<td>Mary Flynn</td>
<td>Programme Manager National Clinical Programme in Surgery</td>
</tr>
<tr>
<td>Sheila Sugrue</td>
<td>Director of Midwifery, Office of Nursing &amp; Midwifery Services Director</td>
</tr>
</tbody>
</table>
### Appendix 1c: NEWS Consultant Advisory Group Membership

<table>
<thead>
<tr>
<th>Name</th>
<th>Discipline</th>
<th>Work Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Siobhan Kennelly</td>
<td>NCAGL</td>
<td>Integrated Care Programmes/Older Person Services</td>
</tr>
<tr>
<td>Dr. Gerry McCarthy</td>
<td>Clinical Lead</td>
<td>Emergency Medicine Programme</td>
</tr>
<tr>
<td>Dr. Martina Healy</td>
<td>Clinical Lead</td>
<td>NCP Sepsis</td>
</tr>
<tr>
<td>Dr. Susan Foley</td>
<td>Consultant Respiratory Physician</td>
<td>University Hospital Waterford/CAG NCP COPD</td>
</tr>
<tr>
<td>Dr. Maria Donnelly</td>
<td>Consultant Anaesthetist</td>
<td>Tallaght University Hospital</td>
</tr>
<tr>
<td>Ms. Deborah McNamara</td>
<td>Clinical Lead</td>
<td>NCP Surgery</td>
</tr>
<tr>
<td>Dr. Donncha O’Gradaigh</td>
<td>Consultant Rheumatologist/QI &amp; EBP</td>
<td>University Hospital Waterford</td>
</tr>
<tr>
<td>Professor Michael Turner</td>
<td>Clinical Lead</td>
<td>NCP Obstetrics and Gynaecology</td>
</tr>
<tr>
<td>Dr. Dorothy Breen</td>
<td>Consultant Anaesthetist/Quality Lead</td>
<td>Cork University Hospital</td>
</tr>
<tr>
<td>Dr. Jason Horan</td>
<td>Consultant Emergency Medicine</td>
<td>Mayo University Hospital/NEWS GDG</td>
</tr>
<tr>
<td>Ms. Christine Sheehan</td>
<td>Advanced Nurse Practitioner Critical Care Outreach</td>
<td>Galway University Hospital/NEWS GDG</td>
</tr>
<tr>
<td>Professor Jonathan Drennan</td>
<td>Research</td>
<td>University College Cork</td>
</tr>
<tr>
<td>Dr. Michael Power</td>
<td>Clinical Lead</td>
<td>Critical Care Programme</td>
</tr>
<tr>
<td>Ms. Avilene Casey</td>
<td>National Lead</td>
<td>Deteriorating Patient Improvement Programme (DPIP)</td>
</tr>
<tr>
<td>Ms. Ciara Hughes</td>
<td>Programme Manager</td>
<td>DPIP/Sepsis</td>
</tr>
<tr>
<td>Ms. Davinia O’Donnell</td>
<td>Performance &amp; Portfolio Lead</td>
<td>Clinical Design &amp; Innovation</td>
</tr>
<tr>
<td>Dr. Miriam Bell</td>
<td>Project Lead</td>
<td>DPIP/NEWS Guideline revision</td>
</tr>
<tr>
<td>Mr. Brendan Leen</td>
<td>Regional Librarian</td>
<td>HSE South</td>
</tr>
</tbody>
</table>
Appendix 1d: Letter of invitation to NEWS CAG members from Chief Clinical Officer HSE

By Email Only

From: Dr Colm Henry, Chief Clinical Officer

To: 

Re: Consultant Advisory Group NEWS.

Date: 28th May 2019

Dear

The National Deteriorating Patient (Recognition and Response) Improvement Programme (DPIP) is one of the key priority Patient Safety Programmes of the Chief Clinical Officer (CCO), in the 2019 National Service Plan. One of the work-streams of DPIP is the revision and updating of the DoH/NCEC National Clinical Guidelines No. 1 NEWS (National Early Warning System)(2013). A NEWS Guideline Development Group (GDG) is drafting new NEWS guideline recommendations. To underpin this work, HRB-CICER are conducting a systematic literature review in parallel to the GDG revision. This is to ensure an evidence based approach to the review of the guideline. Some key clinical issues have emerged as a result of the GDG deliberations and international evidence which need focused attention. The issues are as follows:

- Physiological Parameter Adjustments (in particular in relation to Respiratory Patients)
- Escalation Thresholds and Response Models

To assist with addressing these specific clinical issues, a short term Consultant Advisory Group (CAG) will be set up. We anticipate a commitment of approximately four face to face meetings. I would like to invite you to participate on this NEWS guideline CAG.
Please advise if you are in a position to participate in this group by email to Miriam.bell@hse.ie by Friday the 7th of June 2019. Once you have confirmed your availability to participate in this group, relevant reading materials will be sent to you.

The first meeting will take place on the morning of the 26th of June 2019, details to follow.

Yours sincerely,

Dr. Colm Henry  
Chief Clinical Officer
### Appendix 1e: External Reviewers

<table>
<thead>
<tr>
<th>Name</th>
<th>Title and Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Professor Peter Watkinson</strong></td>
<td>Associate Professor of Intensive Care Medicine, Joint Clinical Lead for Critical Care Research Group, John Radcliffe Hospital, Oxford</td>
</tr>
<tr>
<td><strong>Dr. Mandy Odell</strong></td>
<td>Nurse Consultant Critical Care, Royal Berkshire NHS Foundation Trust</td>
</tr>
<tr>
<td><strong>Professor Imogen Mitchell</strong></td>
<td>Dean of Medicine, Australia National University, Senior Intensive Care Specialist, Canberra Hospital and Senior Medical Advisor Australian Commission on Safety and Quality in Healthcare</td>
</tr>
</tbody>
</table>
Appendix 2: Literature search strategy

‘Methods’ section below is taken directly from the HRB-CICER (2018) systematic review of the literature to underpin the NEWS NCG No. 1 guideline revision process.

**Methods**

This systematic review update presents the available evidence to estimate the clinical effectiveness and cost-effectiveness of the NEWS in Ireland. In reporting this systematic review we have adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria.\(^{(14)}\) For the qualitative review question, we have adhered to the ENTREQ (Enhancing transparency in reporting the synthesis of qualitative research) guidelines.\(^{(15)}\) The protocol for this systematic review has been registered on the PROSPERO database of systematic reviews and meta-analyses and was agreed on by the NEWS GDG in January 2018 at a guideline development meeting

(Link: [http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018088048](http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018088048)).

**Criteria for including studies within this review**

**Search Process**

Searches were conducted consistent with the search strategy developed by the research team involved in the previous review.\(^{(2)}\) Key terms and their variations were associated with the PICOS (Population/Patient/Problem, Intervention, Comparison, Outcome, Study design) framework which is applicable when addressing a clearly defined clinical question relevant to a defined population group and clinical context.\(^{(16)}\) Key terms included a combination of terms associated with “early warning scoring systems”. The search strategy is detailed in Appendix 2. The economic literature search was based on the clinical literature search strategy with the addition of an economic filter for the Medline and EMBASE search.\(^{(17)}\)

**Types of participants, interventions, comparisons, outcomes and study design**

The PICOS (or modified PICOS) for each review question (1-6) are presented separately in Table 0.1, Table 0.2, Table 0.3, Table 0.4, Table 0.5 and Table 0.6.
Table 0.1 Specific PICOS for Review Question 1

<table>
<thead>
<tr>
<th><strong>Q1: What EWSs and or track and trigger systems are currently in use for the detection or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?</strong></th>
</tr>
</thead>
</table>
| **Population** | Adult (non-pregnant) patients in acute (hospital) health care settings admitted to an adult ward.  
- In Irish hospitals, patients aged 16 years or older are classified as adults.  
- More often, adult refers to patients aged 18 years or older. |
| **Description/ Objective/Aims** | Description of EWS:  
- EWS, e.g. NEWS  
- Modified EWS  
- VitalPAC™ EWS (ViEWS)  
- Track and Trigger System |
| **Outcome(s)** | Type of EWS (NEWS, MEWS, comparisons of EWS)  
- Details of vital sign parameters recorded and weightings given to each vital sign  
- Single-parameter EWS compared to aggregate EWS  
- General acute patients or specific sub-populations  
- Evaluation of chart design (paper-based EWS compared to digital EWS)  
- Implementation of EWSs and/or RRS or METs |
| **Study design** | Effectiveness studies, development and validation studies |


Table 0.2 Specific PICOS for Review Question 2

<table>
<thead>
<tr>
<th><strong>Q2: How effective are the different EWSs in terms of improving key patient outcomes in adult (non-pregnant) patients in acute health care settings?</strong></th>
</tr>
</thead>
</table>
| **Population** | Adult (non-pregnant) patients in acute (hospital) health care settings admitted to an adult ward  
- In Irish hospitals, patients aged 16 years or older are classified as adults  
- More often, adult refers to patients aged 18 years or older |
| **Intervention** | Early warning scoring systems (EWS): EWS, Modified EWS, VitalPAC™ EWS (ViEWS), Track and Trigger System |
| **Comparison** | Usual care, other EWS |
| **Outcome(s)** | Primary:  
- Mortality  
- Cardiac arrest  
- Length of stay  
- Transfer/admission to the ICU or HDU  
Secondary:  
- Clinical deterioration in sub-populations  
- PROMs (validated tools)  
- Any other outcomes identified post-hoc |
| **Study design** | Effectiveness studies, development and validation studies |

**Key:** ICU: Intensive Care Unit, HDU: High Dependency Unit, PROMS: Patient Reported Outcome Measures.
Table 0.3 Specific PICOS for Review Question 3

<table>
<thead>
<tr>
<th>Q3: What education programmes have been established to train healthcare professionals (HCPs) relating to the implementation of EWSs or track and trigger systems for the detection/timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Population</strong></td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
</tr>
<tr>
<td><strong>Comparison</strong></td>
</tr>
</tbody>
</table>
| **Outcome(s)** | Education outcomes  
**Primary:**  
- Increase in knowledge and performance  
- Effect on patient outcomes  
- Improved patient rescue strategies  
**Secondary outcomes:**  
- Improved documentation of patient observations  
- Improved compliance  
- Effectiveness of mode of delivery (i.e. online vs. face-to-face delivery)  
- Any other outcomes identified post-hoc |
| **Study design** | Effectiveness studies, development and validation studies |

Key: HCP: Health care professional, ALERT™: Acute Life-threatening Early Recognition and Treatment.

Table 0.4 Specific PICOS for Review Question 4

<table>
<thead>
<tr>
<th>Q4: What are the findings from the economic literature on cost-effectiveness, cost impact and resources involved with the implementation of EWSs or track and trigger systems for the detection or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?</th>
</tr>
</thead>
</table>
| **Population** | - Adult (non-pregnant) patients in acute (hospital) healthcare settings admitted to an adult ward.  
- In Irish hospitals, patients aged 16 years or older are classified as adults.  
- More often, adult refers to patients aged 18 years or older. |
| **Intervention** | EWS, Modified EWS, VitalPAC™ EWS (ViEWS), Track and Trigger System |
| **Comparison** | Usual care, other EWS |
| **Outcome(s)** | Cost utility analysis: QALYs, HYE, DALYs  
Cost-effectiveness analysis: Cost per unit of effect [cost per LYG], Effects per unit cost [LYG per Euro spent]  
Cost-benefit ratios: ICERs, Incremental cost-per QALY  
Any measure of economic outcomes: Resource use (Length of stay [hospital or ICU/HDU], ICU/HDU admissions, Unexpected ICU/HDU admissions, Use of RRT and MET), Costs (Implementation costs, Escalation costs, Service utilisation costs, Direct medical costs, Indirect medical costs, Education costs and cost savings) |
| **Study design** | Economic evaluation studies, costing studies |

Table 0.5 Specific PICOS for Review Question 5

Q5: Are modified EWSs (e.g. CREWS) more effective than the NEWS for the detection or timely identification of physiological deterioration in specific adult sub-populations in acute health care settings?

| Population                                                                 | Sub-populations of adult patients in acute settings  
|                                                                            | 1) Frail older adults  
|                                                                            | - Must be defined with a validated frailty scale for inclusion  
|                                                                            | 2) Adults with chronic respiratory conditions including (chronic hypoxia, chronic hypoxaemia/hypoxemia, chronic physiological abnormalities, pulmonary fibrosis or COPD)  
|                                                                            | - Chronic hypoxaemia will be defined based on target oxygen saturations levels of 86-92% and target oxygen saturations levels of 94-98% for others¹³, ¹⁸ |
| Intervention                                                               | Modified EWS (e.g. CREWS) |
| Comparison                                                                 | NEWS (Studies comparing CREWS to usual care will not be relevant to this question) |
| Outcome(s)                                                                 | - Type of EWS (Name of modified EWS or NEWS)  
|                                                                            | - Vital sign parameters recorded and weightings given to each vital sign  
|                                                                            | - Single-parameter EWS compared to NEWS  
|                                                                            | - Clinical deterioration and outcomes including mortality, cardiac arrest, LOS, transfer/admission to the ICU or HDU |
| Study design                                                               | Effectiveness studies, development and validation studies |


Table 0.6 Specific PICOS for Review Question 6

Q6: Why do HCPs fail to escalate as per the NEWS escalation protocol?

| Population                                                                 | Stakeholders including HCPs and their managers |
| Phenomenon/Study aims                                                      | Evidence to identify the range of factors, including barriers and facilitators, in very high and high-income settings that influence why HCPs fail to escalate as per the NEWS protocol |
| Outcome(s)                                                                | Qualitative outcomes:  
|                                                                            | - Barriers and facilitators, which will be categorised as follows:  
|                                                                            | - Management/organisational/setting specific issues  
|                                                                            | - Education/training issues  
|                                                                            | - EWS specific issues |
| Study design                                                               | Qualitative studies including focus group interviews, individual interviews, observation, document analysis with qualitative methods of analysis (i.e. thematic analysis, framework analysis, grounded theory) |

Key: HCP: Health Care Professional, NEWS: National Early Warning Score.

Types of setting
Studies conducted in the acute hospital setting in countries classified as either very high or high human development countries on the Human Development Index were considered for inclusion in this review in order to maximise the transferability of the research findings to the Irish context.¹⁹
Search methods for identification of studies
Clinical and economic literature

The following digital databases were searched for published literature for review questions 1-4 from November 2015 until February 19th 2018. In addition, the same databases were searched for the two new additional questions (question 5 on parameter adjustments in specific sub-populations including frail older adults and adults with chronic respiratory conditions, and question 6 on why HCPs fail to escalate as per protocol) from January 2011 in line with the previous review update search criteria until February 19th 2018.

- Academic Search Complete
- Cumulative Index to Nursing and Allied Health Literature (CINAHL)
- Applied Social Sciences Index and Abstracts (ASSIA)
- Medical Literature Analysis and Retrieval System Online (MEDLINE)
- PsycARTICLES
- PsycINFO
- Psychology and Behavioral Sciences Collection
- SociINDEX
- Excerptamedica Database (EMBASE)
- Health Management Information Consortium (HMIC)
- The Cochrane Library (www.cochranelibrary.com) which includes: The Cochrane Database of Systematic Reviews, The Cochrane Methodology Register (CMR) [ceased updating in 2012, archived in the Cochrane Library], The Cochrane Central Register of Controlled Trials (CENTRAL), Database of Abstracts of Reviews of Effects (DARE) [ceased updating in 2015, archived in the Cochrane Library], The Health Technology Assessment Database (HTA) [last update October 2016], and The National Health Service Economic Evaluation Database (NHS EED) [ceased updating in 2015, archived in the Cochrane Library] via MEDLINE.

Other sources
This grey literature search was guided by the handbook produced by the Canadian Agency for Drugs and Technology in Health (CADTH) (20) to supplement the digital database searches to find relevant clinical evaluations, economic evaluations, validation studies and guidelines. A detailed list of the grey literature databases and websites for guidelines on the use of early warning or track and trigger systems in adult (non-pregnant) patients in the acute health care setting which were searched on February 20th 2018 can be found in Appendix 3.
In addition, clinical trial registers were searched (e.g., WHO Clinical Trials Search Portal: [http://apps.who.int/trialsearch/](http://apps.who.int/trialsearch/), which allows for searching multiple databases simultaneously) for completed but unpublished and on-going clinical trials on February 21st 2018. The search for economic evaluations was supplemented with searches of the following websites on February 21st 2018:

- New York Academy of Medicine ([https://nyam.org/](https://nyam.org/))
- Health Service Executive (HSE) ([https://www.hse.ie/eng/](https://www.hse.ie/eng/))
- Health Information and Quality Authority (HIQA) ([https://www.hiqa.ie/](https://www.hiqa.ie/))
- Health Research Board (HRB) Ireland ([http://www.hrb.ie/home/](http://www.hrb.ie/home/))
- World Health Organization (WHO) ([http://www.who.int/en/](http://www.who.int/en/))
- National Institute for Health and Care Excellence (NICE) ([https://www.nice.org.uk/](https://www.nice.org.uk/))
- Institute of Health Economics (Alberta Canada) ([https://www.ihe.ca/](https://www.ihe.ca/))
- National Health Service UK (NHS) ([https://www.england.nhs.uk/](https://www.england.nhs.uk/))
- National Coordinating Centre for Health Technology Assessment (NCCHTA) ([https://www.nihr.ac.uk/funding-and-support/funding-for-research-studies/funding-programmes/health-technology-assessment/](https://www.nihr.ac.uk/funding-and-support/funding-for-research-studies/funding-programmes/health-technology-assessment/)).

Finally manual searching of the reference lists of any included study was conducted.

**Inclusion and exclusion criteria**

Inclusion and exclusion criteria for each review question (1-6) are outlined in **Table 0.7**.
### Table 0.7 Inclusion and exclusion criteria according to review question

<table>
<thead>
<tr>
<th>Inclusion criteria</th>
<th>Question 1 (EWS)</th>
<th>Question 2 (Outcomes)</th>
<th>Question 3 (Education)</th>
<th>Question 4 (Economics)</th>
<th>Question 5 (Sub-populations)</th>
<th>Question 6 (Qualitative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult acute setting patients (16 years or older) (Excluding paediatric, obstetric, ED patients and DNR patients)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Investigated the implementation and or effectiveness of EWSs and or track and trigger systems developed to facilitate the early detection of deterioration and escalation of care</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Investigated the effectiveness of education programmes used to train registered HCPs in relation to EWSs and or track &amp; trigger systems (Excluding EWS not suitable for bedside monitoring)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Acute hospital setting in countries categorised as either very high or high HDI(19)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Data were pre- and post-critical adverse clinical event(s) or pre-post EWS intervention or pre-post education intervention</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Comparison of modified EWSs (e.g. CREWS) to the NEWS only in specific sub-populations (frail older adults, patients with severe respiratory conditions)</td>
<td></td>
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<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Qualitative study design</td>
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<td></td>
<td>X</td>
</tr>
<tr>
<td>Quantitative study designs of a randomised and non-randomised nature including effectiveness studies, development studies and economic studies (Excluding study designs with no intervention or outcome data, i.e. case reports or vignettes, early development studies, literature reviews, conference abstracts and letters)</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>Grey literature</td>
<td>X</td>
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<td>English language</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*Published since November 2015 (Update)                                           |                  |                       |                        |                        |                            |                         |
**Published since January 2011 (New review questions)                              |                  |                       |                        |                        |                            |                         |

Key: An ‘X’ denotes that the specific inclusion criteria apply to the particular review question. ED: Emergency Department, DNR: Do Not Resuscitate, EWS: Early Warning System, HCP: Health care Professional, HDI: Human Development Index, CREWS: Chronic Respiratory Early Warning System, NEWS: National Early Warning System. *Questions 1-4 are consistent with the previous review update which searched the literature until November 2015. **Questions 5 and 6 are new questions and the search began from the starting date of the last review update (January 2011).
Data collection and analysis
Selection of studies
All potentially eligible papers identified in the searches were exported to Endnote (Version 7) where duplicates were identified and removed. The titles and abstracts of the remaining citations were each reviewed independently by two people as per the inclusion and exclusion criteria to determine whether the papers merited a full text review. The full texts were obtained and independently evaluated by two members of the team. Any disagreements were resolved by discussion, or if necessary, a third reviewer (members of the GDG with clinical and subject matter expertise).

Data extraction and management
Data were extracted from clinical literature pertaining to the evaluation of EWSs or track and trigger systems under the following headings:

- Authors
- Year and country of publication
- Study design
- Aim of study
- Description of the intervention
- Study outcomes

The economic review data were extracted in relation to the following elements, in line with the HIQA guidelines for the retrieval and interpretation of economic evaluations of health technologies in Ireland:(21)

- Study question, population, intervention and type of EWS, comparator and setting
- Modelling methods
- Sources and quality of clinical data
- Sources and quality of cost data
- Cost data
- Resource usage
- Study outcomes, and methods used in synthesis
- Outcomes and benefits
- Methods for dealing with uncertainty.

Separate data extraction tables were used according to the review question:

- Empirical clinical papers relating to use of EWSs or track & trigger systems used in adult (non-pregnant) patients
- Evaluation of education programs involving the education or training of HCPs relating to EWSs or track & trigger systems used in adult (non-pregnant) patients
- Empirical economic literature relating to EWSs or track & trigger systems used in adult (non-pregnant) patients
- Empirical clinical papers relating to EWSs or track and trigger systems in frail, older adults or patients with severe respiratory conditions and whether it is appropriate to adjust physiological parameter cut-off values, and which parameters should be adjusted, in order to maximise the predictive ability of the NEWS
- Empirical qualitative papers relating to EWSs or track and trigger systems and why HCPs fail to escalate as per the NEWS protocol.

Data extraction was performed by two members of the review team independently using the agreed data extraction form to ensure consistency. Any discrepancies were resolved through discussion, or if required, consultation with a third reviewer.

Assessment of methodological limitations and risk of bias
- Two reviewers independently assessed the methodological quality or risk of bias of included studies, using standardised critical appraisal instruments, with any disagreements resolved through discussion. Different study designs warrant different tools to assess methodological quality, thus the following instruments were used as appropriate (see Table 0.8).

In this review a number of different types of non-randomised and observational studies are included, these are defined below:[22]

- Non-randomised controlled trial- An experimental study in which people are allocated to different interventions using methods that are not random.
- Controlled before-and-after study- A study in which observations are made before and after the implementation of an intervention, both in a group that receives the intervention and in a control group that does not.
- Interrupted-time-series study- A study that uses observations at multiple time points before and after an intervention (the ‘interruption’). The design attempts to detect whether the intervention has had an effect significantly greater than any underlying trend over time.
- Cohort study- study in which a defined group of people (the cohort) is followed over time, to examine associations between different interventions received and subsequent outcomes. A ‘prospective’ cohort study recruits participants before any intervention and follows them into the future. A ‘retrospective’ cohort study identifies
subjects from past records describing the interventions received and follows them from the time of those records.

Table 0.8 Critical Appraisal Instruments

<table>
<thead>
<tr>
<th>Study category</th>
<th>Critical appraisal instrument</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCTs</td>
<td>Cochrane Risk of bias tool(^{(23)})</td>
</tr>
<tr>
<td>NRCTs, CBA studies, ITS studies</td>
<td>Risk of bias criteria for Cochrane EPOC reviews(^{(24)})</td>
</tr>
<tr>
<td>Clinical practice guideline</td>
<td>AGREE II tool, ‘rigour of development’ domain (National Quality Assurance Criteria for Clinical Guidelines(^{(25)}))</td>
</tr>
<tr>
<td>Observational designs</td>
<td>Newcastle Ottawa Scale(^{(26)})</td>
</tr>
<tr>
<td>Economic evaluations</td>
<td>1. CHEC-list for quality assessment(^{(27)}), 2. ISPOR to assess transferability(^{(28)})</td>
</tr>
<tr>
<td>Development &amp; validation studies</td>
<td>The QUADAS 2 Tool(^{(29)})</td>
</tr>
<tr>
<td>Qualitative studies</td>
<td>CASP(^{(30)}) Qualitative Checklist</td>
</tr>
</tbody>
</table>


The Newcastle Ottawa Scale quality appraisal tool\(^{(26)}\) was used for observational studies. We rated the quality of the studies (good, fair and poor) by awarding stars in each domain following the guidelines of the Newcastle–Ottawa Scale. A “good” quality score required 3 or 4 stars in ‘selection’, 1 or 2 stars in ‘comparability’, and 2 or 3 stars in ‘outcomes’. A “fair” quality score required 2 stars in selection, 1 or 2 stars in comparability, and 2 or 3 stars in outcomes. A “poor” quality score reflected 0 or 1 star(s) in selection, or 0 stars in comparability, or 0 or 1 star(s) in outcomes. In total where a study received ‘6’ or more stars, it was considered a ‘good quality study’. Where a study received ‘5’ stars, it was considered a ‘fair quality study’ and where a study received ‘4 or less’ stars it was considered a ‘poor quality study’, as described in Sharmin et al.\(^{(31)}\)

**Data synthesis**

**Review questions 1-5 (Quantitative)**

The HIQA guidelines on clinical effectiveness were adhered to with regard to data synthesis.\(^{(32)}\) A meta-analysis was not possible due to differences in how outcomes were measured (heterogeneity). A narrative synthesis, which takes methodological differences between
primary studies into account, was completed and an overall picture of the evidence is presented. For the economic literature review, the evidence was compiled and condensed using a narrative synthesis and supported by evidence tables. The HIQA guidelines on retrieval and interpretation of economic evaluations of health technologies were adhered to.\(^{(21)}\)

**Review question 6 (Qualitative)**

The evidence on why HCPs fail to escalate was synthesised in the form of a thematic analysis.\(^{(33, 34)}\)

Two review team members read all included papers a number of times to achieve absorption of the data. Both review team members manually extracted the text from each study (results section only) and coded line by line in Excel, and developed initial sub-themes and overarching themes independently. Following multiple discussions and re-analysis of the draft themes and sub-themes as well as presentation of the findings to the guideline development group at a meeting in November 2018, the review team members reached consensus on the final overarching themes and sub-themes. The findings are presented according to themes generated which were coded for each included study. Themes including barriers and facilitators to NEWS were sub-categorised as follows where possible:

- Management/organisational/setting specific issues
- Education/training issues
- EWS or Track and Trigger System specific issues
- Other

**Assessing the certainty of the body of evidence using the GRADE approach**

**Review Questions 1-5**

Where appropriate, 'Summary of findings' (SOF) tables using the GRADEpro software were generated for the primary outcomes of each review question.\(^{(35)}\) The certainty of the evidence for each outcome was assessed using the GRADE approach as outlined in the GRADE handbook where appropriate.\(^{(36)}\) We downgraded the evidence from high quality by one level for serious (or by two levels for very serious) limitations, depending on our assessments of the risk of bias, indirectness of evidence, serious inconsistency, imprecision of effect
estimates, or potential publication bias. Evidence was graded as high, moderate, low or very low.\textsuperscript{(36)}

\textit{Review question 6}

For qualitative studies, we used the GRADE-CERQual (Confidence in the Evidence from Reviews of Qualitative research) approach to summarise our confidence in the evidence.\textsuperscript{(37)} Four components contribute to an assessment of confidence in the evidence for an individual review finding: methodological limitations, relevance, coherence, and adequacy of data. The CERQual components reflect similar concerns to the elements included in the GRADE approach for assessing the certainty of evidence on the effectiveness of interventions. However, CERQual considers these issues from a qualitative perspective. Confidence in the evidence was graded as high, moderate, low, or very low for each key finding.
Results

Search results for all review questions
The search strategy for all review questions identified 54,271 potentially relevant records through searching the listed digital databases and grey literature sources. After removing duplicates, 36,445 records were screened independently by two reviewers, with a further 36,110 references excluded based on titles and abstracts. A total of 335 full-text articles were assessed for eligibility. Of these, 203 references were excluded according to the inclusion and exclusion criteria (section Error! Reference source not found.). This resulted in 132 studies being included in the review. Manual checking of the reference lists of included studies identified a further 22 eligible studies, bringing the total number of studies included in this review to 154\(^1\). The breakdown of eligible studies for each review question is:

- N=123 studies for questions 1 and 2 (a description of EWSs and their effectiveness on patient outcomes)
- N=23 studies for question 3 (the effectiveness of different EWS-based educational interventions)
- N=3 studies for question 4 (an economic evaluation of the cost-effectiveness of EWSs)
- N=4 study for question 5 (the effectiveness of EWSs in specific sub-populations, i.e. frail elderly adults and patients with COPD or respiratory conditions).
- N=18 studies for question 6 (qualitative focus on why HCPs fail to escalate as per the NEWS protocol).

This process is depicted in Figure 0.1.

Presentation of results according to review question
The overall results, quality appraisal and the summary of the evidence for each review question (1-6) are presented in chapters 4-12.

\(^1\) Note some studies are eligible for inclusion in more than one review question and therefore the total number of studies across all six questions will not sum to n=154.
Figure 0.1 Study flow diagram for all six questions in the systematic review

*Note some studies are eligible for inclusion in more than one review question and therefore the total number of studies across all six questions will not sum to n=154.
Review Question 1: Characteristics of EWSs currently in use for the detection of acute physiological deterioration in adult (non-pregnant) patients in acute health care settings – one EWS only studies

<table>
<thead>
<tr>
<th>Author, Country</th>
<th>No of parameters, Name of EWS</th>
<th>Parameters included in EWS</th>
<th>Paper-based or digital</th>
<th>Recording of parameters</th>
<th>Aggregate EWS, score</th>
</tr>
</thead>
<tbody>
<tr>
<td>(110) Abbott (2016), UK</td>
<td>10-item NEWS</td>
<td>RR, SpO₂, FiO₂, SBP, HR, AVPU, Temp, Lactate, glucose, base excess</td>
<td>Paper-based</td>
<td>Not reported</td>
<td>Yes (0-3)</td>
</tr>
<tr>
<td>(117) Albert (2011), USA</td>
<td>12-item MEWS</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, Urine output, level of consciousness, WBC, difficulty breathing, new focal weakness, staff or family concern.</td>
<td>Digital</td>
<td>Not reported</td>
<td>Yes (0-3)</td>
</tr>
<tr>
<td>(118) Al-Qahtani (2013), Saudi Arabia</td>
<td>Single items, not combined</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, Urine output, level of consciousness using GCS, staff concern about the patient</td>
<td>Digital</td>
<td>4-hourly</td>
<td>No</td>
</tr>
<tr>
<td>(119) Bailey (2013), USA</td>
<td>7-item EWS with real-time automated alerts generated 24/7.</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, Shock index, anticoagulation use, DBP</td>
<td>Digital (algorithm-based)</td>
<td>Not reported</td>
<td>No</td>
</tr>
<tr>
<td>(119) Beiter (2011), USA</td>
<td>Single items, not combined</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, Clinical judgement/concern</td>
<td>Not reported</td>
<td>Not reported</td>
<td>No</td>
</tr>
<tr>
<td>(118) Bunkenborg (2014), Denmark</td>
<td>6-item MEWS</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp</td>
<td>Paper-based</td>
<td>8-hourly</td>
<td>Yes (0-3)</td>
</tr>
<tr>
<td>(120) Capan (2015), USA</td>
<td>7-item NEWS</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, Shock index, anticoagulation use, DBP</td>
<td>Digital (algorithm-based)</td>
<td>Not reported</td>
<td>Yes (0-3)</td>
</tr>
<tr>
<td>(121) Churpek (2013a), USA</td>
<td>8-item EWS</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, DBP</td>
<td>Digital (algorithm-based)</td>
<td>Not reported</td>
<td>No</td>
</tr>
<tr>
<td>(121) Churpek (2012), USA</td>
<td>5-item MEWS</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, DBP, pulse pressure index (=SBP-DBP/SBP), shock index (=SBP/HR)</td>
<td>Digital</td>
<td>8-hourly</td>
<td>Yes (0-3)</td>
</tr>
<tr>
<td>(121) Churpek (2015), USA</td>
<td>8-item MEWS</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, DBP, pulse pressure index (=SBP-DBP/SBP), shock index (=SBP/HR)</td>
<td>Digital</td>
<td>4-hourly</td>
<td>Yes (0-3)</td>
</tr>
<tr>
<td>(124) Davis (2015), USA</td>
<td>Single items, no specific EWS – criteria for activating RRT.</td>
<td>RR, SpO₂, SBP, HR, AVPU, Temp, Chest pain, acute blood loss, Arterial Blood Gas test obtained, PetCO₂ rise; laboured breathing, persistent apneas, staff concern, family concern.</td>
<td>Not reported</td>
<td>Not reported</td>
<td>No</td>
</tr>
</tbody>
</table>

*Note: Above table included as a sample evidence table. 154 studies were included in this review therefore inclusion of all evidence tables would interfere with circulation of the draft revised NEWS (2020) guideline due to document size. All evidence tables available on request from Miriam.bell@hse.ie*
Appendix 4: Consultation report

List names of stakeholder/organisations invited to contribute and noted those that responded (table below can be used). Outline also the process for stakeholder consultation and any changes made as a result.

<table>
<thead>
<tr>
<th>Date</th>
<th>Circulated to:</th>
<th>Responded: Yes/No</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients groups</td>
<td>Via June Boulger (<a href="mailto:june.boulger2@hse.ie">june.boulger2@hse.ie</a>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External review</td>
<td>Professor Peter Watkinson Dr. Mandy Odell Professor Imogen Mitchell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical Programmes and healthcare divisions</td>
<td>ONMSD via Dr. Geraldine Shaw, D/ONMSD Office of Chief Clinical officer, CCO, HSE NCPs (Clinical leads, Nurse Leads): Surgery via Dr. Deborah McNamara NAMP, Prof. Garry Courtenay Emergency Medicine via Dr. Gerard McCarthy Sepsis via Dr. Martina Healy Paediatrics via Dr. John Fitzsimons Critical Care via Dr. Michael Power Anaesthesia via National Director and Deputy Director Acute Hospitals Division HSE CEOs/GMs and Clinical Directors Acute Hospitals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National committees</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional groups</td>
<td>Nursing and Midwifery Board of Ireland INMO CORU and HSCPs groups, via Ms. Jackie Reid) IARO via Ms. Breda Ward RANPs via Christine Sheehan, Galway HEIs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>NOCA via Ms. Collette Tully</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 5: Economic assessment

The following excerpt has been taken directly from the HRB-CICER (2018) systematic review of the literature which underpinned the NEWS (2013) NCG revision.

Findings from the economic literature on the implementation of EWSs or track and trigger systems for the detection of acute physiological deterioration in adult (non-pregnant) patients in acute health care settings.

Chapter overview

This chapter in the systematic review update focusses on the literature relevant to question four of the review. “What are the findings from the economic literature on cost-effectiveness; cost-impact and resources involved with the implementation of EWSs or track and trigger systems for the detection of or timely identification of physiological deterioration in adult (non-pregnant) patients in acute health care settings?” The characteristics of the included studies are described as well as the findings from each study reported, and the methodological quality and transferrability of the included studies is assessed. In accordance with national health technology assessment (HTA) guidelines, the costs from previous economic evaluations were adjusted and are presented in 2017 euro.\(^{(21)}\)

Characteristics of the economic studies included in the review

In total, three studies were eligible for inclusion. These included one health technology assessment (HTA) on the implementation of an digital NEWS,\(^{(3)}\) one budget impact analysis (BIA) as part of National Clinical Guideline (NCG) No. 1 (The NEWS)\(^{(4)}\) and one costing study.\(^{(5)}\) Two studies were conducted in Ireland,\(^{(3, 4)}\) and one in the Netherlands.\(^{(5)}\) Two of the studies included the NEWS,\(^{(3, 4)}\) and one included the implementation of a rapid response system (RRS).\(^{(5)}\) The populations included acute adult inpatients,\(^{(3)}\) acute medical patients,\(^{(4)}\) and surgical patients.\(^{(5)}\) Hospital or ICU length of stay (LOS) were the key clinical outcomes included (Table 0.9).

Table 0.9 Characteristics of studies included in the economic systematic review

<table>
<thead>
<tr>
<th>Study author</th>
<th>Intervention</th>
<th>Design (no. of studies)</th>
<th>Condition(s) or population targeted</th>
<th>Type of economic evaluation</th>
<th>Clinical Outcomes</th>
</tr>
</thead>
</table>
A narrative synthesis of the results is presented given the heterogeneous nature of the economic studies included.

**HIQA 2015 Health Technology Assessment of the implementation of an digital EWS**

The HTA conducted by HIQA in 2015(3) on the use of information technology for early warning and clinical handover systems evaluated the resources that would be required to introduce a digital EWS in an Irish hospital (530-bed) setting compared to no EWS, as well as the resources gained (reduced hospital LOS). Data from a UK study by Jones et al.,(88) were used to estimate reductions in LOS by applying them to Irish LOS data. The results showed average LOS on a general ward was reduced by 28.9% (CI 18.6% - 40.3%) and ICU average LOS by 40.3% (4.6% - 76%), leading to additional national hospital capacity of 802,096 bed days per annum relative to a total capacity of 2.8 million acute hospital bed days per annum and 30,628 ICU bed-days per annum relative to a total capacity of 76,000 ICU bed days per annum (Table 10.2). This was considered an efficiency gain rather than a monetary saving as the beds would be used for other patients. The digital EWS was also found to be 1.6 times faster than a paper EWS leading to a reduction in staff time spent recording vital signs (not included in BIA as opportunity savings). The costs of changing to an digital EWS were examined over a five year period from a healthcare system perspective. Resources were split into technology-based costs (hardware, software and integration fees) and implementation costs (staff, education,
Two types of license fees were examined (annual fee and once off payment) with the annual licence fee being the best value for money: €1,017,880 (€1,042,614) per site compared to €1,332,272 million euros per site (€1,364,646) over five years. The HTA indicated there is some evidence that the implementation of digital EWS has contributed to reduced mortality rates and a change in general and ICU LOS (which varied from a minimal relative reduction up to 40.3% and 76% reductions, respectively). Improved efficiency and accuracy of recording vital sign parameters, compliance with escalation protocols and significant user (clinician) satisfaction were also reported. However, as the quality of the included studies of effectiveness was variable and the interventions performed in a range of healthcare jurisdictions with a variety of outcomes measured, the ability to generalise the findings to the Irish healthcare context may be limited (Table 0.10).

**NCEC 2013 NEWS NCG No.1**

A budget impact analysis (BIA) was conducted for the original NEWS NCG No. 1 in 2013,\(^1\) to assess the costs of implementing the NEWS and the accompanying multidisciplinary COMPASS\(^\text{TM}\) educational programme. Taking a healthcare perspective initial implementation costs (staff education and material) as well as on-going intervention costs (staff and non-staff costs) were included in the BIA. Initial costs (these were the one off costs incurred during the initial roll out of the COMPASS\(^\text{©}\) education programme nationally) were estimated at 7.47 million euros (most of this was related to staff costs to attend training and was therefore an opportunity cost, cost year was not reported) with on-going costs estimated at 425,000 euros annually. Additional resources would be required due to the expected increase in response rate triggers, but no cost estimates were provided within the BIA. Annual savings were reported at 4.2 million euros (reduction in ICU bed days from cardiac respiratory arrests based on a single study, estimates not reported in study) in efficiency savings rather than monetary gains (Table 0.10).

**Simmes 2014 Implementation of a RRS**

The costs before and after the introduction of a RRS (which consisted of a clinician-led MET triggered by a single-parameter EWS) on a surgical ward in a Dutch hospital were estimated in a cost analysis study by Simmes et al.\(^5\) The RRS was associated with a significant absolute increase in ICU admissions (from 2.5% – 4.2%) without a decrease in severity of illness (mean
APACHE II score 17.5 versus 17.6) and median ICU LOS (3.5 days versus 3 days, \( P = 0.94 \)) and a 0.25% absolute reduction in cardiac arrest. There was no change in hospital LOS as a result of implementing the RRS. Mean cost per patient of the RRS was €26.87 euros (€28.46), including implementation and maintenance (1%), training (3%), nursing time (8%), MET consults (2%) and extra unplanned ICU days (85%). A scenario analysis was also performed, whereby the APACHE II score was reduced to 14. This reduced the mean daily RRS costs per patient by over 60%, even when MET consults had increased by one third and ICU admissions by one fifth. In this scenario analysis mean RRS costs per patient day were reduced by €16.69 (62%) to €10.18 (€10.78); MET costs increased by €0.19 to €0.76 and costs for extra unplanned ICU days decreased by €16.90 to €5.99. The scenario analysis demonstrated that reducing the APACHE II score to 14, whereby less severely ill patients are referred to ICU, could reduce costs. Overall, RRS costs (including implementation, maintenance, training, nurse time and MET consultations) were considered low by Simmes et al.,(5) but the costs for extra unplanned ICU days after implementation of the RRS were high (Table 0.10).
### Table 0.10 Results of the economic studies included in the review

<table>
<thead>
<tr>
<th>Author, country (year)</th>
<th>Population and Interventions</th>
<th>Analysis details</th>
<th>Costs and clinical outcomes</th>
<th>Analysis of uncertainty</th>
<th>Results</th>
</tr>
</thead>
</table>
| HIQA, Ireland (2015)   | Population: Model 4, 530-bed teaching hospital, adult in-patient services excluding maternity and paediatrics  
Intervention: Digital NEWS  
Comparator: Paper-based EWS | Analysis type: BIA  
The benefit estimates were based on extrapolated results from a study identified in the systematic review that most closely represented the Irish context and which reported on the impact on LOS.  
Perspective: Health care perspective  
Time horizon: 5 years  
Discount rate: Not applicable | Currency & cost year: Irish euro, 2013.  
Cost components: Technology-based costs (hardware, software and integration fees) and implementation costs (staff, education, clinical leadership and project management). Two types of licence fees were examined (annual fee and once off payment).  
Clinical outcomes: Reduction in LOS, from a single study deemed applicable. | The cost of license fees, maintenance and hardware were varied by 20%. Initial cost estimates were derived from an NHS pilot study | Costs (over five years): five year national investment requirements have been estimated as €40.1m and €51.4m for Type 1 and Type 2 licenses, respectively.  
Total costs per site (Type 1 licence): €1,017,880  
Total costs per site (Type 2 licence): €1,332,272  
Breakdown of costs:  
Project management:  
Type 1: €227,453, Type 2: €119,200  
Licence fees, hardware and maintenance:  
Type 1: €767,117  
Type 2: €1,189,762  
Staff training:  
Type 1: €23,310  
Type 2: €23,310  
Clinical outcomes:  
Relative risk reduction in average LOS by 28.9% (95% CI 18.6%-40.3%) and ICU ALOS by 40.3% (4.6% - 76%), leading to additional national hospital capacity of 802,096 bed days per annum and 30,628 ICU bed-days per annum. |
| NCEC, Ireland (2013)  | Population: Adult acute medical patients  
Intervention: NEWS and COMPASS educational programme  
Comparator: Current practice | Analysis type: BIA  
Perspective: Health care perspective  
Time horizon: 12 months  
Discount rate: Not applicable | Currency & cost year: Not specified.  
Cost components: Initial phase: Staff (Trainees, Trainers), Non-staff (Materials (Manuals, CDs, Sample Observation Charts and ISBAR charts).  
On-going intervention costs: Non-staff (NEWS charts), Staff (Additional measurements, Charting score, Additional resources to respond to trigger, Ongoing education)  
Clinical outcomes: ICU bed days | Not reported in study. | Costs:  
Total implementation costs (initial phase [These are the one off costs which will incurred during the initial roll out of the COMPASS© education programme nationally]): €7,490,400  
Total on-going intervention costs: €425,000 per annum  
Initial phase:  
Non-staff: €18,000 (once off cost in rolling out COMPASS©)  
Staff: Trainees (€7.3 million, opportunity costs), Trainers (€172,400)  
Education initial phase: €18,000 (materials); On-going: €425,000 per annum  
ALERT™ licence fee: The COMPASS© Education Programme replaced the ALERT system which included an annual licence fee of approximately €600 which was being paid by 10 hospitals. Thus moving to COMPASS© resulted in an annual saving of €6,000.  
Clinical outcomes:  
€4.2 million per annum (reduction in ICU bed days, CRAs) |
| Simmes, The Netherlands (2014) | Population: Surgical patients >3 days post major surgery. There were 1,376 patients in | Analysis type: Costing study.  
Perspective: Health care perspective | Currency & cost year: Dutch Euro, 2009  
Cost components:  
A scenario analysis was performed, where the APACHE II score was reduced to 14, whereby less severely ill | Costs:  
Mean RRS costs were €26.87 per patient-day. Which consisted of Implementation: €0.33 (1%)  
Training: €0.90 (3%)  
Nursing time spent on extended observation of vital signs: €2.20 (8%) |
<table>
<thead>
<tr>
<th>Author, country (year)</th>
<th>Population and Interventions</th>
<th>Analysis details</th>
<th>Costs and clinical outcomes</th>
<th>Analysis of uncertainty</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>period 1 (before, 1 year) and 2,410 patients in period 2 (after, 2 years). <strong>Intervention:</strong> Implementation of a RRS <strong>Comparator:</strong> 1,376 patients in period 1 (before, 1 year).</td>
<td><strong>Time horizon:</strong> 24 months. <strong>Discount rate:</strong> Not applicable.</td>
<td>Training, staff, MET consults, Coordination and continuation costs <strong>Clinical outcomes:</strong> LOS, Unanticipated ICU admissions, ICU LOS patients were referred to ICU. This reduced the mean daily RRS costs per patient by over 60%, even when MET consults had increased by one third and ICU admissions by one fifth. <strong>Scenario analysis:</strong> mean costs per patient day were €10.18.</td>
<td></td>
<td>MET consults: €0.57 (2%) Increased number of unplanned ICU days after RRS implementation: €22.87 (85%) Total coordination and continuation cost of RRS: €3,618 per annum. (Additional workload coordination: 1 x nurse hour per week: €1,568; and continuation 20 nurse hours per year and 10 doctor hours per year: €2,050) Training total: €27,291 or €0.90 per patient day (3% of mean RRS cost per day). <strong>Clinical outcomes:</strong> A non-significant decrease in cardiac arrest and/or unexpected death from 0.5% to 0.25% (statistical tests not provided). A significant increase in the number of unplanned ICU admissions after implementation (2.5% versus 4.2%), without a decrease in severity of illness (mean APACHE II score 17.5 versus 17.6) and median ICU LOS (3.5 days versus 3 days, ( P = 0.94 )) Hospital LOS was unchanged</td>
</tr>
</tbody>
</table>

**Key:** **HIQA:** Health information and Quality Authority; **NCEC:** National Clinical Effectiveness Committee; **RRS:** Rapid Response System; **MET:** Medical Emergency Team; **LOS:** Length of stay; **ICU:** Intensive Care Unit.
Methodological quality and transferability
The quality of the included studies was assessed by two reviewers using the CHEC-list tool (The Consensus Health Economic Criteria list)\(^{(27)}\) and the transferability of included studies was assessed using the ISPOR tool (International Society for Pharmacoeconomics and Outcomes Research).\(^{(28)}\) Where the criteria were applicable to the included studies, the quality of the studies was judged to be good overall. However, given that the studies were not full economic evaluations, a number of the criteria were not relevant or applicable. In addition, some of the costs reported are based on findings from a single hospital or trial which may not be transferable to the Irish setting, given the heterogeneity of such settings.

CHEC-list quality appraisal
The 19-item CHEC-list tool was applied to the three included studies, including two BIAs and one costing study. The majority of the CHEC-list items were adequately described in all three studies. Competing alternatives were not reported in the NCEC BIA (item 2).\(^{(1)}\) Important and relevant costs for each alternative were not included in the costing study (Item 7).\(^{(5)}\) An incremental analysis of costs and outcomes of alternatives was not performed in any of the studies (Item 13) and discounting was not applicable to any of the three studies (Item 14). Sensitivity analyses were only reported in the HIQA BIA (Item 15).\(^{(3)}\) None of the studies discussed the generalisability of the results to other settings or patient groups (Item 17). One study did not report on conflicts of interest (Item 18).\(^{(5)}\) Ethical issues were not applicable to all three studies (Item 19). (Table 0.11).

ISPOR transferability tool
The 11-item ISPOR tool was used to assess the included studies transferability based on the relevance and credibility (validation, model design, data, analysis, reporting, interpretation of results and conflict of interest). For the ‘relevance’ domain, all three studies were deemed to have suitable and relevant populations (item 1), no missing critical interventions (item 2), no missing outcomes (item 3), and were deemed to be based in an appropriate setting (item 4). For the ‘credibility’ domain, as none of the studies included full economic models (there were two BIAs and one costing study) the model specific items on the checklist were not applicable as a result (items 1, 2 and 3 in validation). For design (item 4), the costing study was not applicable as there was no model included;\(^{(5)}\) whilst the two BIAs were judged to be
appropriate. For *data* (item 5), and *analysis* (items 6 and 7) the HIQA BIA\(^3\) was deemed appropriate as the data included was based on a systematic review and included an analysis of uncertainty, whilst the two other studies were deemed inappropriate given the data were from a single study which may not be transferable and provided no uncertainty analyses. For *reporting* (item 8) and *interpretation* (item 9) all three studies provided adequate information. A conflicts of interest statement (item 10) was not reported in the costing study\(^5\) and item 12 (steps taken to address any conflicts of interests) was not applicable to all three studies (*Table 0.12*).
### Table 0.11 CHEC-list quality appraisal of included economic studies

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1. Is the study population clearly described?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2. Are competing alternatives clearly described?</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>3. Is a well-designed research question posed in answerable form?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>4. Is the economic study design appropriate to the stated objective?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>5. Is the chosen time horizon appropriate to include relevant costs and consequences?</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>6. Is the actual perspective chosen appropriate?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>7. Are all important and relevant costs for each alternative identified?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8. Are all costs measured appropriately in physical units?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>9. Are costs valued appropriately?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>10. Are all important and relevant outcomes for each alternative identified?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>11. Are all outcomes measured appropriately?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>12. Are outcomes valued appropriately?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>13. Is an incremental analysis of costs and outcomes of alternatives performed?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>14. Are all future costs and outcomes discounted appropriately?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>15. Are all important variables, whose values are uncertain, appropriately subjected to sensitivity analysis?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>16. Do the conclusions follow from the data reported?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>17. Does the study discuss the generalizability of the results to other settings and patient/ client groups?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>18. Does the article indicate that there is no potential conflict of interest of study researcher(s) and funder(s)?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>19. Are ethical and distributonal issues discussed appropriately?</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Key:** 1 = Yes, category considered; 0 = No, category not considered; N = Not applicable
### Table 0.12 ISPOR Transferability assessment of included economic studies

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Relevance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Is the population relevant?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2. Are any critical interventions missing?</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>3. Are any relevant outcomes missing?</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>4. Is the context (settings and circumstances) applicable?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Credibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Validation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Is external validation of the model sufficient to make the results credible for your decision?</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2. Is internal verification of the model sufficient to make its results credible for your decision?</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>3. Does the model have sufficient face validity to make its results credible for your decision?</td>
<td>Yes</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td>Design</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Is the design of your model adequate for your decision problem?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5. Are the data used in populating the model suitable for your decision problem?</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Analysis</td>
<td></td>
<td></td>
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<tr>
<td>6. Were the analyses performed using the model adequate to inform your decision problem?</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7. Was there an adequate assessment of the effects of uncertainty?</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Reporting</td>
<td></td>
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<tr>
<td>8. Was the reporting of the model adequate to inform your decision problem?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Interpretation</td>
<td></td>
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<tr>
<td>9. Was the interpretation of results fair and balanced?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Conflict of interest</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Were there any potential conflicts of interest?</td>
<td>No</td>
<td>No</td>
<td>NR</td>
</tr>
<tr>
<td>11. If there were potential conflicts of interest, were steps taken to address these?</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Key:** NA = Not applicable (no model); NR = Not reported
Discussion
There is a dearth of economic literature on EWSs in adult non-pregnant patients in the acute health care setting to detect physiological deterioration, as evidenced by this systematic review. Of the three included studies, there were no full economic evaluations of EWSs in adult patients in acute settings. There was however a HTA on digital EWS, one BIA on EWS, and one costing study (on the implementation of a single parameter-based RRS and the associated costs). In addition, some of the costs and clinical outcomes reported are based on findings from a single hospital or trial, also the currency of the studies may be an issue with no new studies identified during this review update. Thus they may not be transferable to the current Irish setting. The studies included however suggest that EWS have the potential to improve patient outcomes including ICU and hospital LOS and thus reduce health care costs (including potential reduction in cardiac arrests, avoidance of ICU admissions or reduced LOS for example). There is a need to assess the cost-effectiveness of EWSs and a full economic evaluation is warranted. Difficulties in obtaining reliable data however (Chapters 5-7), are a significant barrier.

Conclusion
EWSs, despite the lack of economic data on their cost-effectiveness, have been implemented in many healthcare systems in a number of different countries including Ireland, the UK, America and Australia. Further research is warranted to assess the cost-effectiveness of EWSs given the increasing demands on health systems worldwide.
A well-structured budget impact analysis (BIA) report should be provided. It should be transparent, all assumptions clearly stated, and all gaps identified. A good BIA will have an introduction, main results and conclusion.

The introduction should provide a general overview of what is included in the BIA. It should clearly outline which recommendations are examined in the BIA and which were considered similar to current practice. It should describe how the main section will be structured, for instance, stating if certain recommendations are grouped together.

How best to structure the main results section will depend on the guideline. However, these general points are worth following:

- It is best to start with the direct costs of implementation then follow with the potential cost savings from improved outcomes.
- Outline any areas where it is not clear how the budget might be impacted – it is better to be transparent about gaps than to ‘hide’ them.
- Create one table which pulls all estimated costs together at the end of your main results. Include any estimated savings from improved outcomes and unknown areas. Sample table is here <link from E-learning module>

A short conclusion should summarise the findings and highlight any major gaps in the BIA.
Appendix 6: Implementation plan

Insert the proposed implementation plan to include actions; persons responsible and timelines for implementation of each recommendation. Include also dissemination of the guideline and actions to facilitate implementation.
Appendix 7: Supporting tools

List the supporting tools for this guideline, for example, weblinks or details of patient information leaflets, elearning and related services.
Appendix 8: Monitoring and audit

Sample Audit Tools

Data collection tool: Utilization and accuracy of completion of the NEWS
Patient Observation Chart

- Review vital signs for previous 48 hours

1. Complete the Dataset
2. Determine areas for improvement
3. Take appropriate action
4. Share the learning
5. Repeat

<table>
<thead>
<tr>
<th>NEWS Chart Completion Audit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ward /Area</strong></td>
</tr>
<tr>
<td>Auditor(s)</td>
</tr>
<tr>
<td><strong>Answer Yes, No, N/A to the following questions</strong></td>
</tr>
<tr>
<td><strong>1. Document Standards</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
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<td>3</td>
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<td>6</td>
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<tr>
<td>7</td>
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<tr>
<td><strong>2. Parameters</strong></td>
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<td>16</td>
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<td>17</td>
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<tr>
<td><strong>3. Score</strong></td>
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<tr>
<td>18</td>
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<tr>
<td>19</td>
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</tbody>
</table>

Comment: 

Action: 

112
Data collection tool: Escalation & Response Audit Tool

This audit should be carried out on patients triggering a score of 3 or more and / or where there was a requirement for transfer to higher level of care

1. Complete the Dataset
2. Determine areas for improvement
3. Take appropriate action
4. Share the learning
5. Repeat

<table>
<thead>
<tr>
<th>Ward / Area</th>
<th>Date of Audit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auditor(s)</td>
<td></td>
</tr>
</tbody>
</table>

Answer Yes, No, N/A to the following questions

<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 For the last recorded NEWS score was the escalation &amp; response protocol adhered to in relation to observation frequency?</td>
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<td>2 For the last recorded NEWS score was the escalation &amp; response protocol adhered to in relation to minimum alert?</td>
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<td>3 Was NEWS Score or parameter adjusted?</td>
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<td>4 Was the CNM in charge informed of NEWS Score?</td>
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<td>5 Was there an appropriate increase in the frequency of observations?</td>
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<tr>
<td>6 Was the patient reviewed in a timely manner by the medical team (as per NEWS Escalation and Response Protocol)</td>
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<tr>
<td>7 Evidence of medical response to requested action or review?</td>
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<tr>
<td>8 Did the Doctor formulate and document a post review plan of care and/or NEWS Escalation and Response plan?</td>
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<tr>
<td>9 Was there documented evidence that an intern consulted with a senior doctor?</td>
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<tr>
<td>10 Was there documented evidence that the SHO consulted with a Registrar if no response to treatment within 1 hour?</td>
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<tr>
<td>11 Was there documented evidence that a Registrar reviewed the patient with a NEWS score ≥ 7?</td>
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<tr>
<td>12 Was a higher level of care considered?</td>
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<tr>
<td>13 Was response system activated?</td>
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<tr>
<td>14 Was the patient transferred to a higher level of care where appropriate?</td>
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</table>

Comment:                                                                 |

Action:                                                                 |
Data collection tool: ISBAR Communication Audit Tool – for communication in relation to a deteriorating patient

National Clinical Guideline ‘Communication (Clinical Handover) in Acute and Children’s Hospital Services’ Audit Tool

Note: The ISBAR communication tool should be documented in the patient’s notes and audited as part of a documentation audit and as a step in a quality improvement process.

Date: _____/_____/______ Ward:___________________________________

Was the communication face to face, telephone etc please specify______________

Was the communication documented? Yes ☐ No ☐

Did the documentation contain the following as part of the ISBAR communication tool for patient deterioration:

<table>
<thead>
<tr>
<th>Identification</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity of individual communicating deterioration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identity of patient</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Situation</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identity of individual(s) receiving communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Identity of patient</td>
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<td>No</td>
</tr>
<tr>
<td>Was the reason for calling identified</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Were concerns identified</td>
<td>Yes</td>
<td>No</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Background</th>
<th>Yes</th>
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</thead>
<tbody>
<tr>
<td>Was the relevant background documented?</td>
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</table>

<table>
<thead>
<tr>
<th>Assessment</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Was there evidence of patient assessment?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Patient Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ Stabilised</td>
</tr>
<tr>
<td>☐ Transferred HDU/ICU</td>
</tr>
<tr>
<td>☐ Transferred to other facility</td>
</tr>
<tr>
<td>☐ Death</td>
</tr>
</tbody>
</table>

Observational studies may also be carried out to audit communication in relation to patient deterioration
## NEWS KPIs

<table>
<thead>
<tr>
<th>Q1</th>
<th>Is there a local National Early Warning Systems (NEWS)/EWS Governance Group in place and meetings held on quarterly basis with reports, including the elements of this KPI, submitted to and reviewed by hospital CEO/GM/Clinical Director?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q2</td>
<td>Is the percentage of nursing staff who have completed NEWS training measured, monitored and a plan in place to achieve the target of 85% trained?</td>
</tr>
<tr>
<td>Q3</td>
<td>Is the percentage of medical staff who have completed NEWS training measured, monitored and a plan in place to achieve the target of 85% trained?</td>
</tr>
<tr>
<td>Q4</td>
<td>Prior to Governance Group quarterly meetings has there been an audit of the hospital’s recognition and response practices against key NEWS recommendations (audit of minimum 5 healthcare records quarterly) and reported to the Governance group?</td>
</tr>
<tr>
<td>Q5</td>
<td>Are plans underway to ensure that the aggregated outcomes (total number of cardiorespiratory arrests, unplanned admissions to ICU and readmissions to ICU) are monitored, reviewed and managed at local level?</td>
</tr>
<tr>
<td>Q6</td>
<td>Have identified deficits/gaps been formulated into an improvement plan with key actions and timeframes identified and reported on quarterly to the CEO/GM/Clinical Director?</td>
</tr>
</tbody>
</table>