An Roinn Sláinte
Department of Health

Irish National Early Warning System (INEWS) V2

(previously NEWS)

National Clinical Guideline No. 1

September 2020

National Patient Safety Office
Oifig Náisiúnta um Shábháilteacht Othar

NATIONAL CLINICAL EFFECTIVENESS COMMITTEE

The National Early Warning Score (NEWS) National Clinical Guideline has been updated and revised by the Irish National Early Warning System (INEWS) Guideline Development Group (GDG) under the auspices of the HSE National Deteriorating Patient Recognition and Response Improvement Programme (DPIP).

Using this National Clinical Guideline

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

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 or softcopy) by checking the relevant section in the National Patient Safety Office on the Department of Health website: https://www.gov.ie/en/collection/c9fa9a-national-clinical-guidelines/

Published by:

The Department of Health, Block 1, Miesian Plaza, 50-58 Lower Baggot Street, Dublin 2, D02 VW90, Ireland.

Tel: +353 (1) 6354000

www.health.gov.ie ISSN 2009-6259.

Citation text

Department of Health (2020). Irish National Early Warning System V2 (NCEC National Clinical Guideline No. 1). Available at: https://www.gov.ie/en/collection/c9fa9a-national-clinical-guidelines/

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 Operations Division; Office of the Nursing and Midwifery Services Director; National 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 setting 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). GDG Terms of Reference can be seen in Appendix 1. DPIP Steering Group provided oversight (Appendix 2). Additional clinical input was sought through focus groups with non-consultant hospital doctors and through the establishment of a Consultant Advisory Group (CAG) to advise on key clinical issues which emerged as a result of the guideline revision process. CAG membership and letter of invitation from Chief Clinical Officer can be seen in Appendices 3 and 4 respectively.

Table 1: INEWS GDG membership

Name	Job title and affiliation
Miriam Bell (Co-Chair)	Project Lead, Guideline Revision, National Deteriorating Patient Recognition & Response Improvement Programme (DPIP)
Richard Walsh (Co-Chair)	Director of Nursing, National Acute Medicine Programme
Avilene Casey	National Lead, DPIP
Siobhan Connors	Critical Care Outreach, Tallaght University Hospital, Dublin
Eileen Cotter	Nurse Practice Development Department, South Infirmary Victoria University Hospital, Cork
Derek Cribbin	Nurse Lead, National Clinical Programme Critical Care
Marina O'Connor	Nurse Practice Development Co-ordinator, Our Lady of Lourdes's Hospital, Drogheda
Christine Sheehan	Advanced Nurse Practitioner, Critical Care, University College Hospital Galway
Jason Horan	Consultant in Emergency Medicine, Mayo University Hospital
Brendan Leen	Regional Librarian, HSE South
Rosemary Kratschmar	Patient Representative
Moira Skelly	Patient Representative
Damien Douglas	Patient Representative
Ann-Marie Redmond	Nurse Practice Development Co-ordinator, Wexford General Hospital
Sinead Horgan	Group Sepsis Lead, South/South West Hospital Group
Trisha Rafter	Resuscitation Training Officer, St. Columcille's Hospital, Dublin
Deirdre Staunton	Resuscitation Training Officer, Sligo University Hospital
Liz Casey	Resuscitation and EWS Training Officer, Sepsis Nurse Lead, Mayo University Hospital

Joe Fahy	Resuscitation Training Officer, NEWS, PEWS and Sepsis Nurse Lead, University Hospital Ballinasloe
Anne Scahill	Resuscitation Officer and NEWS, PEWS, IMEWS, Sepsis Nurse Lead, Roscommon University Hospital
Ann Dwyer	Clinical Nurse Manager 2, Trauma and Orthopaedics, Tallaght University Hospital
Maura Moran	Senior Occupational Therapist, Acute Medicine, Beaumont Hospital
Eimear Duff	NCHD (Intern), St. James's University Hospital, Dublin
Lylas Aljohmani	NCHD (Registrar), St. James's University Hospital, Dublin
Yvonne Young	Group Sepsis Lead, University of Limerick Hospital Group
Peter O'Toole	Advanced Nurse Practitioner, National Clinical Programme, COPD
Emma Gorman	Clinical Specialist Physiotherapist, Critical Care, Mater Misericordiae University Hospital, Dublin
Serena Brophy	Project Lead, Service Improvement, DPIP
Irene Regan	Chief Medical Scientist, Children's Health Ireland at Crumlin
Ciara Hughes	Programme Manager, DPIP & Sepsis
Ronan O'Cathasaigh	Project Lead, Education, DPIP

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 GDG for development of this guideline. The NCEC and Department of Health wish to express thanks and sincere gratitude to all persons contributing to this National Clinical Guideline; especially the three patient representatives Rosemary Kratschmar, Moira Skelly and Damien Douglas, who gave of their time on a voluntary basis.

Acknowledgments

The following credits and acknowledgements are made by Ms Avilene Casey, National Lead, HSE Deteriorating Patient Recognition and Response Improvement Programme (DPIP):

Ms Avilene Casey wishes to acknowledge the NEWS GDG members for their valued contributions and consistent work on the revision of this guideline. The sharing of the GDG members' service intelligence, tacit knowledge and clinical expertise enabled a robust and thorough revision of the NCG No.1 National Early Warning Score (2013).

She would particularly like to acknowledge the three patient representatives Rosemary Kratschmar, Moira Skelly and Damien Douglas who gave of their time voluntarily and contributed meaningfully to the guideline revision. The sharing of their personal experiences of using the services provided their GDG colleagues with insight into the service user experience and the need to value and act upon patient/family/carer concerns.

Avilene would like to acknowledge Dr Miriam Bell, Project Lead, DPIP for her leadership of the guideline revision process. Our working partnership facilitated robust debate and challenge to our extant understanding of early warning systems. Her substantial intellectual leadership and facilitation skills enabled full interdisciplinary contributions at all stages of the process. Through her informed critical appraisal, analysis and interpretation of evidence from numerous sources she used emerging evidence and the articulated clinical expertise of GDG, CAG and focus groups to write and prepare the final guideline.

The Consultant Advisory Group (CAG) members are acknowledged for giving of their time, knowledge and clinical expertise at a crucial time in the guideline revision process.

Avilene would like to acknowledge Ms Shelley O'Neill and Dr Sinead O'Neill, HRB-CICER, who undertook the systematic review of the literature, and Mr Brendan Leen, Regional Librarian, HSE South all of whom provided exceptional support to the GDG throughout the guideline revision process.

Also acknowledged are the three expert external reviewers – Professor Imogen Mitchell, Professor Peter Watkinson and Dr Mandy Odell – who provided feedback on the revised guideline.

The draft guideline public consultation process attracted substantial feedback and those who took the time to submit feedback are acknowledged.

Ms Avilene Casey, Dr Miriam Bell and Mr Richard Walsh agreed the additional clinical questions for the systematic review of the literature with Ms Shelley O'Neill and Dr Sinead O'Neill, Health Research Board – Collaboration in Ireland for Clinical Effectiveness Reviews (HRB-CICER) and with the NCEC. Dr Sinead O'Neill and Ms Shelley O'Neill carried out the literature review. Dr Miriam Bell collaborated with Ms Shelley O'Neill and Mr James Larkin and team in conducting the Budget Impact Analysis. Ms Avilene Casey and Dr Miriam Bell successfully submitted the guideline INEWS V2 for NCEC quality assurance.

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

Avilene Casey

National Lead, DPIP Signed by National Lead, DPIP Date: August 2020

National Clinical Guidelines

Providing standardised clinical care to patients in healthcare is challenging. This is due to a number of factors, among them variations 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 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.
3. Publish standards for clinical practice guidance.
4. Publish guidance for National Clinical Guidelines and National Clinical Audit.
5. Prioritise and quality assure National Clinical Guidelines and National Clinical Audit.
6. Commission National Clinical Guidelines and National Clinical Audit.
7. Align National Clinical Guidelines and National Clinical Audit with implementation levers.
8. Report periodically on the implementation and impact of National Clinical Guidelines and the performance of National Clinical Audit.
9. Establish sub-committees for NCEC workstreams.
10. Publish an annual report.

What's new in INEWS V2? Summary of changes

The Irish National Early Warning System (INEWS) now refers to an early warning ***system*** rather than an early warning ***score*** 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, recognise, escalate, respond and evaluate the clinically deteriorating adult patient. The INEWS whole system response involves situation awareness, a bedside track and trigger tool (INEWS observation chart) as an adjunct to clinician anticipation of deterioration, an escalation protocol (outlined on INEWS observation chart) an appropriate tiered clinician response (outlined in local INEWS implementation policy) and over-arching governance to include after action review, audit and improvement cycles (governance according to local appropriate Clinical Governance Committee).

The word 'Irish' has been added to the guideline title, making it the Irish National Early Warning System or INEWS to distinguish between the different systems in use in Ireland and the United Kingdom.

Changes to INEWS recommendations

Recommendations have been reduced from 60 in NEWS (2013) to 43 in INEWS V2 (2020). While some recommendations have been retained others are new thus recommendation numbers are different in this second version of NCG No. 1. **The INEWS V2 recommendations can be seen in full in Section 1.1.**

Changes in Domain 1 - Measurement and documentation of vital signs and other observations

Recommendation 1: This recommendation has been included to emphasise the role of clinical judgement in the anticipation, recognition, escalation, response and evaluation of patient deterioration.

Recommendation 4: 'New confusion/altered mental status/delirium' has been added to the neurological assessment tool to highlight that this can be an important sign of early deterioration. AVPU thus changes to ACVPU on the INEWS observation chart.

Recommendation 5: The frequency of monitoring of observations following admission has been increased to 6- hourly from 12 hourly for the first 24 hours following admission in acknowledgement of the vulnerability of patients in the 'acute' phase of illness in the 24 hours following admission.

Recommendation 6: This recommendation is aligned to Recommendation 1 and emphasizes the role of clinical judgement when using INEWS.

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 INEWS score adjustment as this moves away from the evidence-based INEWS and effectively removes a patient from an early warning system (see Recommendations 16a and 16b).

Changes in Domain 2 - Escalation of Care

Recommendation 11: The GDG and CAG decided to allow for a brief period of deferred escalation of care by registered nursing staff in situations where the cause of vital sign derangement is obvious and easily remedied. This highlights the role of clinical judgement when using INEWS (see Recommendations 1 and 6).

Changes in 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 INEWS Escalation and Response Protocol should not be modified within the first 24 hours following admission. After 24 hours the INEWS Escalation and Response Protocol may be amended by a Registrar or Consultant and documented on the INEWS observation chart as a modified *INEWS Escalation and Response Protocol* (see Recommendation 7).

Recommendation 17: The modified INEWS Escalation and Response Protocol should be reviewed every 24 hours by a Registrar or Consultant to ensure it remains applicable and appropriate to the patient's clinical condition.

Recommendation 18: This recommendation details the minimum information the modified INEWS Escalation and Response Protocol 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 or Advanced Nurse Practitioner response teams, it will take some time for this to become standard practice across all acute settings.

Recommendation 20: As the CAG has endorsed a 3-tiered response model 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 INEWS V2.

Changes in 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 of deterioration (see Recommendation 33). Situation awareness 'Cues for Caution' are included on the INEWS patient observation chart.

Recommendation 26: While clear documentation and communication is always required following clinical review a distinction is drawn between a normal medical plan of care and a ***modified*** INEWS Escalation and Response Protocol. The ***modified*** INEWS Escalation and Response Protocol is specific to a Registrar or Consultant decision to modify the standard INEWS Escalation and Response Protocol outlined on the INEWS observation chart for those patients whose baseline observations may fall outside of normal INEWS parameter ranges (see Recommendations 7, 16a and 16b).

Changes in Domain 5 - Leadership and Governance

Recommendation 28: Clinical leadership at Consultant level is necessary for the sustained implementation and improvement of the INEWS; 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, INEWS, 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.

Changes in Domain 6 - Education

Recommendation 34: It is recommended that education and training in the use of the INEWS should be a mandatory requirement for relevant healthcare professionals.

Recommendation 37: It is acknowledged that as the 3-tiered response model evolves focused education and training programmes may be required for urgent and emergency tier responders.

Changes in Domain 7 - Evaluation, Audit and Feedback

Recommendation 39: It is essential that findings from INEWS and clinical outcome audits e.g. in-hospital unanticipated cardiorespiratory arrest are communicated to senior management and frontline staff and acted upon.

Recommendation 41: At national level the HSE has a responsibility to drive the clinical audit agenda in relation to the deteriorating patient in the acute setting.

Changes in Domain 8 - Systems to Support High Quality Healthcare

Recommendation 43: To support frontline staff in the implementation and ongoing improvement of INEWS the move towards digital early warning systems should be progressed.

Table of Contents

Page No.

Page No.

List of tables

List of figures

Glossary of terms and abbreviations

Definitions within the context of this document

Ceiling of Care: Limit of care. The aim is to provide guidance to staff so that there is clarity about a patient's previously expressed wishes and/or limitations to their treatment. It may need review from time to time in line with the organisation's guidelines and the wishes of the patient/family/carer as appropriate

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

Confusion (new): New onset confusion, acutely altered mental status or delirium. Confusion considered 'new' until proven otherwise.

Digital INEWS: An IT system which incorporates the track and trigger, escalation and alert elements of the INEWS.

Escalation of Care: the point at which a clinician successfully contacts/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

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

INEWSS - INEWS score: The INEWS score is a product of the aggregated weight assigned to each of seven physiological parameters. The INEWS score is captured on the INEWS observations chart, a track and trigger tool which is an adjunct to clinical judgement for the purpose of assisting the identification of the acutely unwell patient.

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

(Modified) INEWS Escalation and Response Protocol: In some circumstances a Registrar or Consultant may decide that a patient's baseline observations fall outside of the normal INEWS physiological parameter ranges. In this instance a modified INEWS Escalation and Response Protocol is documented on the INEWS observation chart 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. A patient's INEWS score or the INEWS physiological parameter ranges must not be altered.

Must: The use of 'must' indicates an absolute duty to comply with a principle. It commands the action a clinical staff member (doctor, nurse, health and social care professional) is obliged to take from which no deviation is allowed.

Nursing Scope of Practice: the range of roles, functions, responsibilities and activities which a registered nurse…is educated, competent and has authority to perform.

Physiological parameters: INEWS uses seven parameters (six physiological parameters plus a weighting for supplemental oxygen) to quantify the severity of acute illness.

Physiological parameter ranges: INEWS uses the ViEWS physiological parameter ranges. Normal ranges for each physiological parameter are detailed in the INEWS physiological parameter scoring key and on the INEWS observation chart. If a patient's observations fall within these normal ranges, they score '0' for each parameter, thus, a patient's INEWS score is '0'. When a patient's observations fall outside of the normal parameter ranges, they score 1, 2 or 3 for each affected parameter depending on the level of derangement. The scores for each of the seven parameters are then added to give a patient's INEWS score.

Safety huddle: Safety huddles are brief and routine meetings for sharing information about potential or existing safety problems facing patients or workers. They increase safety awareness among front-line staff, allow for teams to develop action plans to address identified safety issues, and foster a culture of safety. Situation awareness 'cues for caution' are included on the INEWS patient observation chart to guide this practice.

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. Situation awareness 'cues for caution' are included on the INEWS patient observation chart.

Unanticipated Cardiopulmonary Arrest: a cardiac or respiratory arrest in the absence of a 'Do Not Attempt Cardiopulmonary Resuscitation (DNACPR)' order.

Abbreviations

ACVPU	Alert, Confusion, Voice, Pain, Unresponsive
BIA	Budget Impact Analysis
BIU	Business Information Unit
BP	Blood pressure
CAG	Consultant Advisory Group
CCO	Chief Clinical Officer
CEO	Chief Executive Officer
CPA	Cardiopulmonary arrest
DOH	Department of Health
DPIP	Deteriorating Patient Recognition and Response Improvement Programme
EOLC	End of Life Care
EMEWS	Emergency Medicine Early Warning System
EWS(s)	Early Warning System(s)
GDG	Guideline Development Group
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HCA	Health Care Assistant
HCPs	Healthcare Professionals
HCRs	Healthcare Records
HCWs	Healthcare Workers
HDU	High Dependency Unit
HIPE	Hospital In-Patient Enquiry System
HIQA	Health Information and Quality Authority
HLOC	Higher Level of Care
HLOS	Hospital Length of Stay
HRB-CICER	Health Research Board – Collaboration in Ireland for Clinical Effectiveness Reviews
HSCP	Health and Social Care Professional
HSE	Health Service Executive
ICT	Information and Communication Technology
ICU	Intensive Care Unit
IMEWS	Irish Maternity Early Warning System
INEWS	Irish National Early Warning System
INEWSS	Irish National Early Warning System Score
ISBAR	Identify, Situation, Background, Assessment, Recommendation
ITU	Intensive Therapy Unit
KPI	Key Performance Indicator
MET	Medical Emergency Team
NCEC	National Clinical Effectiveness Committee
NCG	National Clinical Guideline
NMBI	Nursing and Midwifery Board of Ireland
NMPDU	Nursing and Midwifery Planning and Development Unit

NOCA	National Office for Clinical Audit
NQAIS	National Quality Assurance Information System
NSP	National Service Plan
NPSO	National Patient Safety Office
ONMSD	Office of Nursing and Midwifery Services Director
PEWS	Paediatric Early Warning System
QAV	Quality Assurance and Verification (Division HSE)
QCM	Quality Care Metrics
QI	Quality Improvement
RRT	Rapid Response Team
SA	Situation awareness
SAE	Serious Adverse Event
TYC	Test Your Care
ViEWS	VitalPac Early Warning System

1 National Clinical Guideline summary

1.1 Summary of recommendations

Measurement and documentation of vital signs and other observations

Recommendation 1
INEWS 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**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Recommendation 2
Observations must be recorded and documented in the INEWS patient observation chart (hard copy or digital) for all patients admitted to an acute setting at the time of admission or initial assessment.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 3
A full set of INEWS observations should be undertaken and documented on the INEWS chart when a patient is transferred between areas within a hospital or on discharge from a higher level of care (HLOC), ED or Theatre Recovery Room and again on arrival to the ward.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 4

The INEWS physiological observations are:

- Respiratory rate
- Oxygen saturation (SpO2)
- Room air or supplemental oxygen (a score of '3' is added for 'any O2')
- Heart rate
- Blood pressure
- Level of consciousness - ACVPU (C=new confusion/altered mental status/delirium)
- Temperature.

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

Certainty of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 5

In the acute 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**

Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 6

The INEWS Escalation and Response Protocol provides guidance on suggested frequency of monitoring of vital signs relevant to the patient's INEWS score. The need for more or less frequent monitoring should be determined by a registered nurse or doctor and documented.

Certainty of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsibility for implementation: **Doctors and nurses.**

Recommendation 7

A patient's INEWS score or the INEWS physiological parameter ranges ***must not*** be altered.

Certainty of evidence: ⊕○○○

Strength of recommendation: **Strong**

Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 8

The patient's INEWS chart (hard copy or digital) should display physiological information in the form of a trend graph. The INEWS 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 INEWS Escalation and Response protocol
- Information about the responses or action required as per Sepsis escalation protocol
- A section for documentation of modified INEWS Escalation and Response Protocol if used
- A section for documentation of Deferred Escalation (Nursing) if used
- Cues for Caution
- ISBAR communication tool.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals, hospital managers, clinical directors, practice development and Quality & Patient Safety Leads.**

Recommendation 9

There are patients for whom the recording of data for the INEWS 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 modified INEWS Escalation and Response Protocol on the INEWS observations chart and in the patient's healthcare record.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Escalation of Care

Recommendation 10

The INEWS Escalation and Response Protocol should be followed in the event of an INEWS trigger.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals, hospital managers, clinical directors and Quality & Patient Safety Leads.**

Recommendation 11
A registered nurse, using their clinical judgement and working within their scope of professional practice, may decide against immediate escalation as outlined in the INEWS Escalation and Response Protocol when they believe that immediate simple measures are likely to reduce the INEWS score over a short period of observation, within or up to a maximum period of 30 minutes. The rationale for the decision not to escalate care should be explicitly documented on the INEWS observation chart and/or nursing record. If the INEWS score does not improve escalation should occur as per protocol.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Nurses, nurse managers and practice development.**

Recommendation 12
In a case where infection (or sepsis) is suspected as the cause of deterioration the Sepsis Clinical Decision Support Tool should be used for the identification, escalation and response to sepsis.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: Strong
Responsibility for implementation: **Doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Recommendation 13
The INEWS Escalation and Response Protocol allows for the capacity to escalate care based only on the concern of the 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**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 14
Patient, family or carer concern is an important indicator for patient deterioration. The INEWS Escalation and Response Protocol allows for the concerns of the patient, family or carer to trigger clinical review (‘patient/family/carer concern’ criterion).

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, nurse managers, health and social care professionals, healthcare assistants, clinical directors and Quality & Patient Safety Leads.**

Recommendation 15
The needs and wishes of patients on End-of-Life-Care Pathways and/or 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**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Response Systems

Recommendation 16a
For the first 24 hours following admission the frequency of observations and the standard *INEWS Escalation and Response Protocol* should not be altered.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Recommendation 16b
After 24 hours a Registrar or Consultant can modify the standard *INEWS Escalation and Response Protocol* based on a patient's baseline, observations trend, clinical risk factors and INEWS score and document these modifications as a ***modified INEWS Escalation and Response Protocol*** on the INEWS observation chart.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

Recommendation 17
The ***modified*** INEWS Escalation and Response Protocol should be reviewed by a Registrar or Consultant doctor every 24 hours and documented on the INEWS observation chart.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

Recommendation 18

A ***modified*** INEWS Escalation and Response Protocol will include at a minimum:

- Rationale for modification of escalation and response
- Timeframe for review of patient and modified response protocol (minimum 24 hourly review)
- Information about further action(s) and/or escalation.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

Recommendation 19

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

- **Bedside response** (INEWS scores of 0-2): nurse-led, ward-based response. An urgent response can be called for scores of 0-2 if there is clinician concern.
- **Urgent response** (INEWS scores of 3-6): response by a clinician or team with competence in the assessment and treatment of acutely ill patients e.g. primary medical practitioner/team or Advanced Nurse Practitioner service.
- **Emergency response** (INEWS 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: **Conditiona**l
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses and health and social care professionals.**

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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams and senior healthcare professionals.**

Recommendation 21

Clinicians 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 or differential diagnosis
3. Be able to undertake appropriate initial therapeutic intervention which may include mobilisation of specialist team
4. Be able to commence stabilisation and maintenance of 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 setting 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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses and health and social care professionals.**

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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals, and Quality & Patient Safety Leads.**

Recommendation 23

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

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Clinical Communication

Recommendation 24
The ISBAR clinical communication tool should be used when communicating information verbally and in writing between healthcare professionals. The ISBAR3 communication tool should be used for interdepartmental and shift handovers.

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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals, healthcare assistants and Quality & Patient Safety Leads.**

Recommendation 25
Safety huddles should be used as forums where staff/patient/family concerns can be raised and discussed.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Recommendation 26
Following clinical review in response to escalation a plan of care should be clearly documented and verbally communicated.
If a Registrar or Consultant determines that a ***modified*** INEWS Escalation and Response Protocol is required it should be clearly documented on the INEWS observation chart and verbally communicated.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

Recommendation 27
In line with best practice and shared decision-making 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 confidentially.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Leadership and Governance

Recommendation 28
Hospital management should designate a Consultant Lead and executive sponsor at senior management level with overall responsibility for the ongoing performance and improvement of the INEWS supported by a designated INEWS co-ordinator.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams and senior healthcare professionals.**

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, INEWS, PEWS, IMEWS, EMEWS, Mortality & Morbidity, ICU admissions and discharges etc.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams and senior healthcare professionals.**

Recommendation 30
The Governance Committee should oversee the ongoing performance and improvement of the anticipation, recognition, escalation, response and evaluation elements of the INEWS 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.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, service users, and Quality & Patient Safety Leads.**

Recommendation 31

A formal guideline/policy framework for the implementation of the INEWS 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.
9. Documentation regulation and management of records.
10. Patient and service user involvement.

Local planned variations to the INEWS 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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, practice development, service users and Quality & Patient Safety Leads.**

Recommendation 32

There should be appropriate policies and documentation regarding goals of care to include '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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, practice development, doctors, nurses and health and social care professionals.**

Recommendation 33

Hospitals should support additional safety practices that enhance the INEWS. 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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Education

Recommendation 34
To improve knowledge, clinical performance and self-confidence in using INEWS it is recommended that INEWS education and training is mandatory for relevant healthcare professionals, that is, nurses, doctors and relevant HSCPs.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, practice development and education providers.**

Recommendation 35
Clinical staff in all acute settings should complete INEWS education and training and maintain their knowledge and skills in INEWS. On induction to an organisation all medical, nursing, HSCPs and HCAs should become familiar with a hospital's INEWS Escalation and Response Protocol.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, practice development and education providers.**

Recommendation 36
Education and training on the use of the INEWS 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 progress this practice.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams and Higher Education Institute (HEIs) partners.**

Recommendation 37
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: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior healthcare professionals, HEI partners and continuing education providers.**

Audit, evaluation and feedback

Recommendation 38
INEWS audit data should be collected and reviewed locally by interprofessional teams to inform improvement and patient outcomes.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Recommendation 39
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 INEWS is used.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Recommendation 40
INEWS implementation and sustainability should form part of the hospital's 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.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, Quality & Patient Safety Lead and service users.**

Recommendation 41
INEWS improvement and sustainability should form part of the Health Service Executive's patient safety and quality improvement strategy. It should be supported through the development and application of a national clinical audit of patient deterioration-related clinical outcomes (e.g. unanticipated cardiopulmonary arrest, unplanned admissions/readmissions to ICU).

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **HSE's National Deteriorating Patient Improvement Programme (DPIP), National Quality Improvement Team, Clinical Design and Innovation and Acute Operations.**

Systems to support high quality care

Recommendation 42
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 INEWS will help to ensure co-ordinated and effective care for patients whose condition is irreversibly deteriorating.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, Quality & Patient Safety Leads, service users and Palliative Care.**

Recommendation 43
A move towards a digital INEWS 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**
Responsibility for implementation: **Acute Operations HSE, Office of the Chief Information Officer HSE, Clinical Design & Innovation HSE, National Patient Safety Programme HSE, National Quality Improvement Team HSE, Hospital and Hospital Group Boards and Executive Management Teams.**

Symbol	Quality rating
⊕⊕⊕⊕	High
⊕⊕⊕◯	Moderate
⊕⊕◯◯	Low
⊕◯◯◯	Very low

GRADE certainty of evidence symbol key

* See Section 2.8, Tables 3 and 4 for additional information

2 Development of the National Clinical Guideline

2.1 Background

Unanticipated cardiopulmonary/cardiorespiratory arrests (CRAs/CPAs) and unplanned admissions and readmissions to the Intensive Care Unit (ICU) in the adult non-pregnant in-patient in the acute setting are now referred to as serious adverse events (SAEs) in the international literature (Bunkenborg et al. 2014, DeMeester et al. 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 (EWSs) in use internationally (HRB-CICER 2019). The National Early Warning System, based on the VitalPac EWS (ViEWS) is in use in Ireland since 2013.

Unanticipated cardiopulmonary 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 settings 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, Massachussetts 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 settings 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 unanticipated cardiopulmonary arrests are captured using HIPE coding and the true figure may be nearer to double the number of events recorded (Earls et al. 2019).

2.2 Clinical and financial impact of early warning systems

A systematic review of the literature was undertaken by the Health Research Board–Collaboration in Ireland for Clinical Effectiveness Reviews (HRB-CICER) to underpin the INEWS guideline update (Annex 1). Sixty-eight studies were identified which investigated the predictive ability of one or more early warning systems (HRB-CICER 2018). 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 (INEWS)

therefore reflects the expert consensus opinion of the INEWS Guideline Development Group and INEWS Consultant Advisory Group alongside all available evidence (literature review, focus groups, audits, critical analyses reports etc).

While the NEWS system has been in use in acute settings 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 INEWS systems prevents large-scale research or audit. The DPIP explored HIPE data using NQAIS Clinical in the four year period between 2015 and 2018 and determined that 3,592 unanticipated cardiopulmonary arrests were recorded to have occurred in patients in the twenty-six Model 3 and Model 4 acute settings 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 5) and the Budget Impact Analysis (Annex 2). It is not possible to estimate savings related to improved outcomes until a national evaluation of INEWS 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/medical emergency teams, early warning systems, 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), based on the VitalPac EWS (Prytherch et al. 2010), 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 EWSs 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), 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 INEWS 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 protocol
- Providing a clear, structured tiered response model.

To be effective INEWS must be supported by a robust system of clinical and organisational governance.

Patient's physiological observations (blood pressure, pulse, respirations etc.) are routinely recorded in acute settings. With the INEWS, each of seven physiological parameters (respiratory rate, oxygen saturation, supplemental oxygen, heart rate, systolic blood pressure, level of consciousness, temperature) 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 INEWS score. The INEWS scoring key can be seen in Figure 1. The INEWS patient observation chart can be seen in Appendix 6. A graphical trend of physiological observations can be seen on the INEWS observation chart. Depending on the score, care can be escalated to senior medical staff as appropriate. The INEWS 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 an INEWS score (i.e. low or 'no' scores). Patient/family/carer concern is also an important indicator for patient deterioration and can initiate a trigger for clinical review.

Information on how to complete the INEWS patient observation chart can be seen in Appendix 7.

Irish National Early Warning System (INEWS) Scoring Key							
SCORE	**3**	**2**	**1**	**0**	**1**	**2**	**3**
Respiratory Rate(bpm)	≤ 8		9 - 11	12 - 20		21 - 24	≥ 25
SpO_2 (%)	≤ 91	92 - 93	94 - 95	≥ 96			
Inspired O_2 ($Fi\,O_2$)				Air			Any O_2
Systolic BP (mmHg)	≤ 90	91 - 100	101 - 110	111 - 249	≥ 250		
Heart Rate (BPM)		≤ 40	41 - 50	51 - 90	91 - 110	111 - 130	≥ 131
ACVPU/CNS Response				Alert (A)			New confusion (C), Voice (V), Pain (P), Unresponsive (U)
Temp (°C)	≤ 35.0		35.1 - 36.0	36.1 - 38.0	38.1 -39.0	≥ 39.1	

Figure 1: INEWS scoring key

On commencement of the revision of the NEWS (2013) 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 at dpip.1@hse.ie

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 INEWS V2 reflect this senior clinical input. CAG membership can be seen in Appendix 3. Letter of invitation from CCO to CAG members can be seen in Appendix 4.

The revised NCG No. 1 INEWS V2 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' INEWS 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. To facilitate this approach situation awareness 'cues for caution' are included on the revised INEWS patient observation chart and include

- Patient's with increasing O2 requirements to maintain SpO2 levels
- Patients located outside of specialist ward
- Patients receiving high-risk/unfamiliar therapies
- Communication concerns between healthcare professionals and/or between healthcare professionals and patients
- Nurse's intuition/'gut-feeling'.

2.4 Aim and objectives

The INEWS aims to provide guidance and evidence-based support to hospital executives, managers and healthcare professionals on best practice in providing 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 setting.

2.5 Guideline scope

The INEWS applies to the non-pregnant adult (≥ 16 years) patient in an acute setting, inclusive of Model 2, 3 and 4 hospitals. The INEWS does not apply to children or pregnant or post-partum women. Continuous monitoring and 1:1 surveillance in Intensive Care Units (ICU)/Therapy Units (ITU) precludes the need for the use of INEWS in these areas (see Recommendation 3 in relation to patient transfer to or from ICU/ITU. There is a move towards adopting INEWS in mental health settings to assist in the recognition and response to physiological deterioration in this patient cohort. The INEWS scoring key was used by healthcare professionals as a tool to assist clinical judgement and decision-making in the Community Assessment Hubs during the Covid19 pandemic.

Early detection of deterioration in children and pregnant women is identified by different physiological parameters and signs to those of adult patients admitted to acute settings. Two other early warning systems were developed specifically for these patient groups: the NCEC NCG No. 12 Paediatric Early Warning System (PEWS)(2016) to detect deterioration in paediatric patients and the NCEC NCG No. 4 Irish Maternity Early Warning System (IMEWS) V2 (2019) to detect deterioration in the pregnant woman. PEWS and IMEWS are currently in use in all paediatric and maternity services in Ireland. The NCEC NCG No. 18 Emergency Medicine Early Warning System (EMEWS)(2018) for use in the Emergency Department setting was published in 2019 and is being implemented nationally on a phased basis.

The National Clinical Guideline No. 1 INEWS V2 relates to the situation in an acute setting, where an adult patient's physiological condition is deteriorating. The general provision of care in an acute setting 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 No. 1 INEWS Version 2 applies to all adult non-pregnant patients (≥16 years) in acute settings. This includes:

- All inpatients at time of admission or on initial assessment
- Any outpatient/day service patients who attend acute settings for an invasive procedure or who receive sedation.
- All patients attending an Acute Assessment Unit (e.g. Medical or Surgical).

The National Clinical Guideline applies to healthcare professionals, doctors, nurses, physiotherapists and healthcare workers 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 INEWS guideline revision process followed the conflict of interest policy set out by the NCEC. All members of the INEWS GDG 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 Deteriorating Patient Improvement Programme (DPIP) is funded by the HSE. 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 the Irish National Early Warning System (INEWS): 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 8. See Annex 1 for the full systematic review.

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 discrimination between patients at risk of adverse outcomes (death, cardiac arrest or unplanned ICU admission) and those not at risk of these outcomes. 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 Healthcare Professionals (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 8. A sample evidence table can be seen in Appendix 9. 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 (Appendix 10). The full literature review is available as Annex 1 at https://www.gov.ie/en/collection/c9fa9a-national-clinical-guidelines/

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 2).

Table 2: Critical appraisal instruments

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

Key: RCT: Randomised Controlled Trial, NRCT: Non-Randomised Controlled Trial, CBA: Controlled Before-After study, ITS: Interrupted Time Series study, EPOC: Effective Practice and Organisation of Care, AGREE: Appraisal Of Guidelines For Research & Evaluation, CHEC-list: The Consensus Health Economic Criteria LIST, ISPOR: International Society for Pharmacoeconomics and Outcomes Research, QUADAS: Quality Assessment of Diagnostic Accuracy Studies, CASP: Critical Appraisal Skills Programme.

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 (Table 3). 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.

Table 3: Grading of the certainty of evidence for recommendations

Symbol	Quality rating	Interpretation
⊕⊕⊕⊕	High	Very confident that the true effect lies close to that of the estimate of the effect
⊕⊕⊕○	Moderate	Moderately confident in the effect estimate; the true effect is likely to be close to the estimate of the effect but there is a possibility that it is substantially different
⊕⊕○○	Low	Our confidence in the effect estimate is limited; the true effect may be substantially different from the estimate of the effect
⊕○○○	Very low	Very little confidence in the effect estimate; the true effect is likely to be substantially different from the estimate of the effect

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 INEWS 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 (Table 4).

Table 4: Factors that strengthen a recommendation

Factors that can strengthen a recommendation	Questions to consider
Benefits and harms of the options	Certainty of this evidence? Is there important uncertainty about how much people value the main outcomes? Are the desirable anticipated effects large? Are the undesirable anticipated effects small? Are the desirable effects large relative to the undesirable effects?
Costs (resource allocation)	Are the resources required small? Is the incremental small relative to the net benefit?
Equity	What would be the impact on health inequities?
Acceptability	Is the option acceptable to key stakeholders?
Feasibility	Is the option feasible to implement?

A strong recommendation reflects the INEWS 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 INEWS 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 INEWS GDG are also included. In addition, the INEWS 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:

1 Measurement and Documentation of Vital Signs and Other Observations
2 Escalation of Care
3 Response Systems
4 Clinical Communication
5 Leadership & Governance
6 Education
7 Evaluation, Audit & Feedback
8 Systems to Support High Quality Care

2.9 Consultation summary

The INEWS 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). It was not feasible to convene a focus group of SHOs. Additional focus groups were held specifically to gain insight into INEWS chart design in terms of ease of use and user-friendliness. Human factors expertise was sought when re-designing the INEWS chart.

The final draft of NCG No. 1 INEWS V2 was circulated to the following for review and feedback:

- Group Directors and Directors of Nursing all Hospital Groups and all acute settings
- Clinical Directors Hospital Groups and acute settings
- ONMSD and all NMPDUs/CNMEs
- NCAGLs, National Clinical Programmes, HSE
- National Clinical Programme Clinical Leads for Surgery, Anaesthesia, Acute Medicine, Emergency Medicine, Critical Care, Sepsis, Paediatrics
- Dr Colm Henry, Chief Clinical Officer, HSE
- National QI Team, HSE
- Nursing and Midwifery Board of Ireland (NMBI)
- Schools of Nursing and Midwifery, HEIs, Ireland
- Colleges of Medicine, HEIs, Ireland
- Office of the Chief Nursing Officer, Department of Health
- Irish College of General Practitioners
- Patient forums
- Regulatory bodies
- Hospital/Group CEOs and GMs
- Professional bodies

Responses received from consultation can be seen in the Consultation report in Appendix 11.

2.10 International External review

International external review of the revised INEWS 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; previously Senior Medical Advisor Australian Commission on Safety and Quality in Healthcare and currently Medical Advisor
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

Professor Imogen Mitchell and Professor Peter Watkinson are experts in their respective fields and internationally recognised pioneers and authors on early warning systems. Professor Mitchell consulted on the original NCEC NCG No. 1 NEWS (2013). Dr. Mandy Odell provided a nursing perspective and was selected as an expert reviewer given her experience of patient-initiated escalation within early warning systems.

The INEWS 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 was reviewed and incorporated into the revised guideline where appropriate.

Human factors expertise was acquired when redesigning the INEWS patient observation chart as were the views of frontline staff who use the INEWS observation chart on a daily basis.

2.11 Implementation

A comprehensive implementation plan for this guideline is outlined in Appendix 5. The Irish National Early Warning System (INEWS) 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 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 INEWS (V2), 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 Irish National Early Warning System (INEWS). 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 INEWS is dependent upon.

It is recommended that local governance groups (INEWS V2 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 INEWS/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 INEWS are listed in Table 5. 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 5: Summary of enablers and barriers to the implementation of INEWS V2

Enablers	Barriers
• Acute clinical deterioration designated a patient safety priority at senior management team level • Organisation-wide communication of the leadership's patient safety priorities • Clinical champion(s) and good local leadership • 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 co-production of improvements • Digital observation recording and alert systems • Conduction and dissemination of research evidence related to INEWS	• Staff familiarity with current INEWS • Staff resistance to change of practice • Absence of clearly defined roles and responsibilities • 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 • INEWS 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 5 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 setting 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 INEWS (V2).

Funding for INEWS implementation and improvement is subject to service planning and the estimates process. However, many recommendations in INEWS represent a reiteration of previous good practice and existing INEWS implementation and are thus cost neutral as outlined in the summary budget impact analysis (BIA) in Section 3.2 (full BIA report available as Annex 2).

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 INEWS V2.
- Assign personnel with delegated responsibility, accountability authority and autonomy to implement and evaluate the NCEC NCG No. 1 INEWS V2. Provide documented clear roles and responsibilities for staff.
- Provide managers and clinician leads with support to implement the NCEC NCG No.1 INEWS V2 and ensure clinical staff have access to and undertake education and training as appropriate to the successful implementation and evaluation of INEWS.
- 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 INEWS from the INEWS/EWS governance group and provide direction on subsequent action plans.
- Enable and support implementation co-ordinators 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 INEWS V2.

Clinician responsibilities:

- Ensure familiarity with and comply with the NCEC NCG No.1 INEWS V2 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 setting.
- Be aware of the role of clinical judgement, anticipatory care and delegation, in using the NCEC NCG No.1 INEWS V2.
- 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 INEWS V2.
- Create and lead engagement with patient/family/carer to co-produce quality improvement initiatives for INEWS.
- 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 INEWS V2.
- Promote and engage in research to improve INEWS.
- Assist with the performance of clinical and healthcare audits associated with INEWS.

Patient/family/carer responsibilities:

- Participate in the co-production of quality improvement initiatives for INEWS.
- Contribute to and/or participate in education programmes to enhance healthcare staff understanding of the patient/family/carer role in escalation of care.

Tools provided as supports for the implementation of NCEC NCG No.1 INEWS V2

- The revised INEWS patient observation chart can be seen in Appendix 6.
- Information on how to complete the INEWS V2 patient observation chart can be seen in Appendix 7
- The revised INEWS e-learning programme can be accessed on www.HSELand.ie
- Implementation guidance is included in detail in Appendix 5.
- The INEWS Physiological Parameter Scoring Key can be seen in Section 2.3 of the NCG No. 1 INEWS (V2) and on the INEWS patient observation chart in Appendix 6.
- Audit tools are available in Appendix 12.
- The INEWS Escalation and Response Protocol can be seen on the INEWS observations chart in Appendix 6.
- The National Quality Improvement Team's QI Method Toolkit (link in Appendix 12).

2.12 Monitoring and audit

Regular audit is required to support implementation of the recommendations within this revised NCG and monitoring the efficacy and on-going performance of INEWS in the acute setting. It is recommended that the audit process is co-ordinated locally in each acute setting by the relevant local governance committee, as per the NCEC NCG No 1 INEWS V2 recommendations. It is recommended that the INEWS audit process has a multidisciplinary approach. 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. Information on frequency of audit and sample sizes can be found in Appendix 12.

INEWS audit datasets

Process measures
Process measures can be audited using the INEWS patient observation chart (track and trigger tool), the INEWS Escalation and Response Protocol and the ISBAR communication tools.

INEWS chart completion audit
The audit for chart completion may be co-ordinated in each acute setting using the Nursing and Midwifery Quality Care Metrics via the Test Your Care IT platform (www.testyourcarehse.com). This data collection and analysis is carried out **on a monthly basis**. If this option in not available, sample audit charts are available in Appendix 12; chart audits should be undertaken **monthly**. Where the compliance is less that 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 protocol audit

To monitor the efficacy and on-going performance of INEWS a more detailed audit of the escalation and response processes should be carried out for:

- patients triggering an INEWS score of 3 or more
- patients who have had an unanticipated cardiopulmonary arrest and/or an unplanned admission/ readmission to ICU
- patients for whom care has been escalated to the urgent or emergency care teams.

Utilisation of ISBAR and ISBAR3 communication tools
The use of ISBAR and ISBAR3 communication tools for communication in relation to deteriorating patient should be audited. This can be done through the National Clinical Guideline No. 11 'Communication (Clinical Handover) in Acute and Children's Hospital Services' Audit Tool Sample template (Appendix 12). All sample audit tools to support the recommended INEWS 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 a hospital's planned patient safety and quality improvement audit cycle as well as the national schedule for clinical audit. Some of these outcome measures are supported by national clinical audit e.g. the 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 and readmissions to ICU/ ITU/ HDU.
- Scope of care decisions for example 'Do Not Attempt Resuscitation' or 'Palliative care' orders.

Structural measures
Structural measures can be audited using education and training records and Key Performance Indicators.

Education/training audit

- Audit of INEWS 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)
INEWS implementation is supported by National KPIs, which are reported quarterly to the Acute Business Information Unit (BIU), HSE. The INEWS KPI measures the '% of hospitals that confirm they are implementing INEWS in all clinical areas of the acute hospital'. The criteria which need to be met are outlined in Appendix 13. The aim of the INEWS KPI is to monitor implementation of INEWS, improve governance through the use of outcome data, improve the recognition and response to the deteriorating adult non – pregnant patient and ensure adequate numbers of healthcare professionals are trained in the use of INEWS.

Audit findings and governance
The audit results and reports should be discussed at the appropriate INEWS/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 INEWS is used (as outlined in recommendations 30 & 31, NCEC NCG No 1 INEWS (V2). 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 INEWS 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 towards maintaining a database of patients whose care is escalated, and are 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.

The 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 INEWS 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 INEWS guideline should be reviewed on a three-yearly basis and updated in line with NCEC procedures. As a result, NCG No. 1 (INEWS) V2 will require updating in 2023 by the DPIP.

3 National Clinical Guideline

3.1 Key questions and evidence statements

Domain 1 – Measurement and Documentation of Vital Signs and Other Observations

Review question 1	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?

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

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 (HRB-CICER 2018). 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	Comparison of the effectiveness of modified Early Warning Systems (e.g. CREWS) to the NEWS for the detection of acute physiological deterioration in specific adult subpopulations in acute health care settings

Review question 5 assessed the effectiveness of modified EWSs in specific sub-populations (frail elderly and patients with chronic respiratory conditions). No studies were identified which assessed the effectiveness of EWSs in the frail elderly population. Four observational cohort studies were identified as being eligible for inclusion which assessed the effectiveness of EWSs in patients with chronic respiratory conditions. 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 discrimination between patients at risk of adverse outcomes (death, cardiac arrest or unplanned ICU admission) and those not at risk of these outcomes. The four included studies were found to be similar to or 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. For this reason, the decision was made to continue with NEWS (INEWS V2) in Irish acute healthcare settings as it is already embedded in the services and the evidence was not considered strong enough to warrant a change at this time.

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 et al. (2017) considered the optimum frequency of recording of vital signs in patients in acute settings as 'an evidence-free zone'; research is required to determine optimum frequency of recording of vital signs. In this context and in acknowledgement of the vulnerability of patients in the acute phase of illness following admission the decision was taken by the GDG and CAG to increase the minimum frequency of observations monitoring to six hourly for the first 24 hours after admission, decreasing to 12 hourly thereafter if the patient's condition and clinical judgement deemed a decrease in frequency of monitoring appropriate.

In addition, evidence from focus groups and from the public consultation process highlighted the need for awareness that a patient's increasing oxygen requirements in the face of an unchanged INEWS score is a sign of clinical deterioration and should be escalated and responded to accordingly.

'New confusion' (new confusion/altered mental status/delirium) has been added to the AVPU scale, making it ACVPU, in recognition of the fact that an acute change in mental status is an important indicator of acute illness severity; patients with new confusion/altered mental status/delirium may demonstrate disturbances in attention, consciousness or cognition (NEWS2 UK, 2017).

Recommendation 1
INEWS 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**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Recommendation 2
Observations must be recorded and documented in the INEWS patient observation chart (hard copy or digital) for all patients admitted to an acute setting at the time of admission or initial assessment.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 3
A full set of INEWS observations should be undertaken and documented on the INEWS chart when a patient is transferred between areas within a hospital or on discharge from a higher level of care (HLOC), ED or Theatre Recovery Room and again on arrival to the ward.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 4
The INEWS physiological observations are:

- Respiratory rate
- Oxygen saturation (SpO2)
- Room air or supplemental oxygen (a score of '3' is added for 'any O2')
- Heart rate
- Blood pressure
- Level of consciousness - ACVPU (C=new confusion/altered mental status/delirium)
- Temperature.

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

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Good practice points

- A systolic blood pressure of ≥200mmHg requires medical review.
- Local hospital policy must be adhered to in relation to the prescribing of supplemental oxygen.
- It should be recognised that a patient's increasing oxygen requirements in the face of an unchanged INEWS score is a sign of clinical deterioration.
- 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 a 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.
- Manual palpation of pulse is recommended to ascertain rate, rhythm, and quality (e.g. bounding, thready etc.).

Recommendation 5

In the acute 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**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Good practice point

When a patient transfers from a HLOC (e.g. Model 3 to Model 2 hospital), the patient's clinical condition is stable and clinical judgement ascertains that the patient does not warrant six hourly observations, local policy can provide guidance on frequency of monitoring.

Recommendation 6

The INEWS Escalation and Response Protocol provides guidance on suggested frequency of monitoring of vital signs relevant to the patient's INEWS score. The need for more or less frequent monitoring should be determined by a registered nurse or doctor and documented.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors and nurses.**

Good practice point

Frequency of observations for post-operative patients and patients on blood transfusions should follow local protocols. Ideally the INEWS observations chart should be used to document these observations to avoid duplication of work.

Physiological parameters and INEWS scores (INEWSS)

The parameter ranges used in INEWS 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 INEWS score (INEWSS) is a product of the aggregated weight assigned to each individual vital sign. Thus, the INEWSS can also be considered to be evidence-based. For this reason, it is never appropriate to adjust either the INEWS parameter ranges or a patient's INEWSS. 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 an INEWSS. 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 modified INEWS Escalation and Response Protocol on the patient's INEWS chart.

The modified INEWS Escalation and Response Protocol must include

- the rationale for the alteration
- a clear timeframe for review of the patient and the modified INEWS Escalation and Response Protocol (minimum 24 hourly review)
- information about further actions and/or escalation of care.

Recommendation 7
A patient's INEWS score or the INEWS physiological parameter ranges ***must not*** be altered.

Certainty of evidence: ⊕○○○
Strength of recommendation: **Strong**
Responsibility for Implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 8
The patient's INEWS chart (hard copy or digital) should display physiological information in the form of a trend graph. The INEWS 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 INEWS Escalation and Response Protocol
- Information about the responses or action required as per Sepsis escalation protocol
- A section for documentation of modified INEWS Escalation and Response Protocol if used
- A section for documentation of Deferred Escalation (Nursing) if used
- Cues for Caution
- ISBAR communication tool.

Certainty of evidence: ⊕○○○
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals, hospital managers, clinical directors, practice development and Quality & Patient Safety Leads.**

Good practice points

- There is a clear distinction between continuous monitoring and a digital INEWS system. A digital INEWS system captures vital signs, calculates an INEWS score and initiates an automated alert.
- When a patient is being continuously monitored in a ward setting, a full set of observations should be documented in the INEWS chart (digital or hard copy). In such circumstance's consideration should be given to checking pulse and blood pressure manually on a regular basis.

Recommendation 9

There are patients for whom the recording of data for the INEWS 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 modified INEWS Escalation and Response Protocol on the INEWS observations chart and in the patient's healthcare record.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Domain 2 – Escalation of Care

Review question 6	Why do healthcare professionals fail to escalate care as per the INEWS escalation protocol?

Evidence statement

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

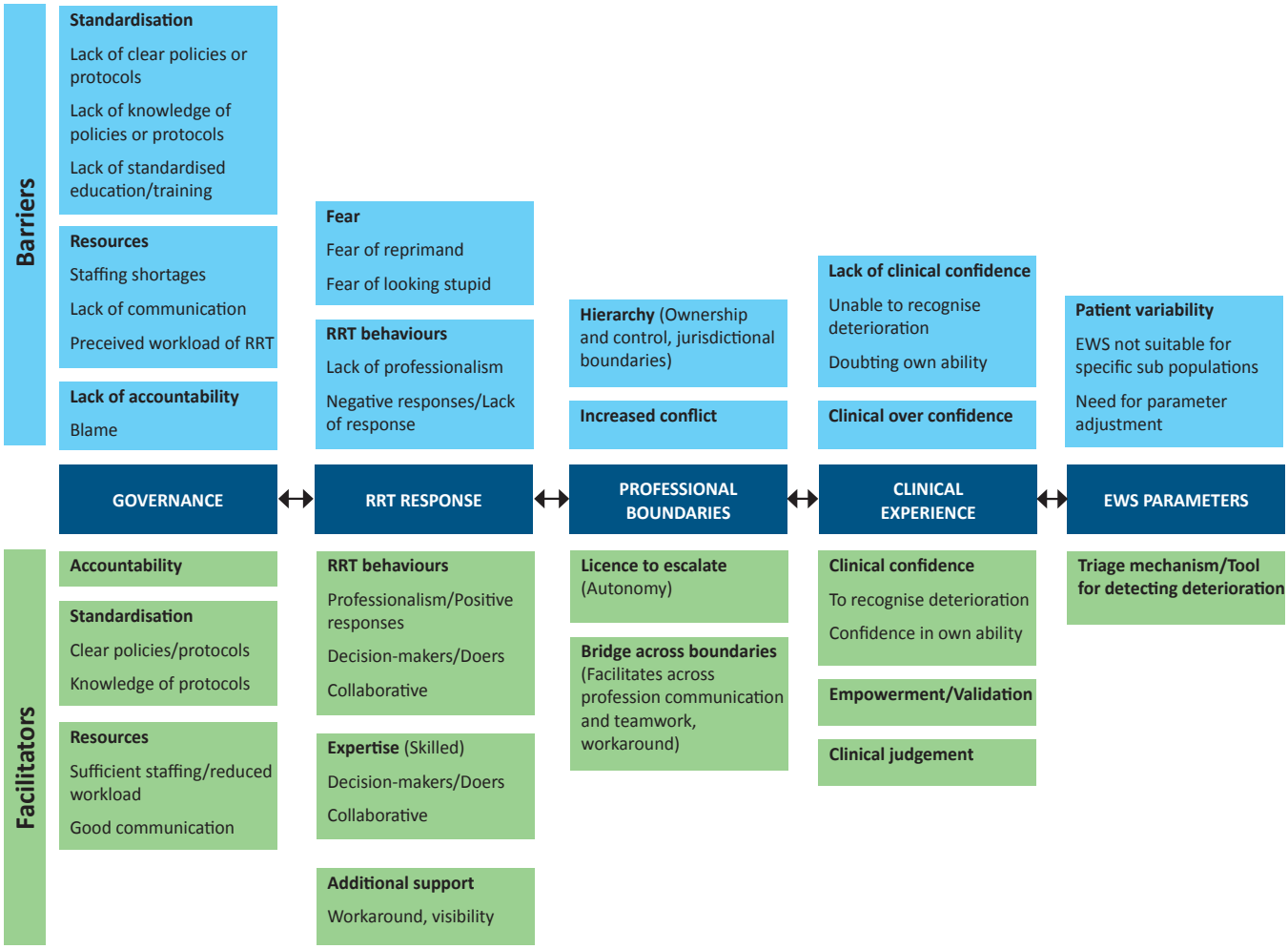


Figure 2: Facilitators and barriers to escalation of care

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 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.

INEWS Escalation and Response Protocol and *modified* INEWS Escalation and Response Protocols

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

Recommendation 10
The INEWS Escalation and Response Protocol should be followed in the event of an INEWS trigger.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals, hospital managers, clinical directors and Quality & Patient Safety Leads.**

Recommendation 11
A registered nurse, using their clinical judgement and working within their scope of professional practice, may decide against immediate escalation as outlined in the INEWS Escalation and Response Protocol when they believe that immediate simple measures are likely to reduce the INEWS score over a short period of observation, within or up to a maximum period of 30 minutes. The rationale for the decision not to escalate care should be explicitly documented on the INEWS observation chart and/or nursing record. If the INEWS score does not improve escalation should occur as per protocol.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Nurses, nurse managers and practice development.**

Good practice points

- There is a readily identifiable cause for the patient's INEWS score that can be addressed
- The decision not to escalate should be made in conjunction with Nurse in Charge (NIC)
- The rationale for the decision not to escalate is explicitly documented on the INEWS observations chart and/or in the nursing notes
- The patient is reassessed by the nurse and a full set of INEWS observations recorded within an agreed review timeframe and follow-on actions determined.

Deferred escalation by registered nursing staff is documented on the INEWS patient observation chart using the 'Deferred Escalation (Nursing)' section an example of which can be seen in Table 6.

Table 6: Example of a Deferred Escalation (Nursing)

Date/Time (Use 24 hour clock)	Rationale and Interventions	Review at 30 minutes	Nurse Signature & NMBI PIN
03/03/2020 @ 1000	Imp: Decrease in SpO_2 to 94%, on 2L/min O_2 via n/prongs, patient lying flat, patient states they feel okay. Intervention: patient repositioned and n/prongs adjusted. Check again within 30 minutes	1030hours: SpO_2 96% on 2L/min, RR 20, patient states they feel comfortable	Nurse A, NMBI PIN 1234

Recommendation 12
In a case where infection (or sepsis) is suspected as the cause of deterioration the Sepsis Clinical Decision Support Tool should be used for the identification, escalation and response to sepsis.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Good practice point

Refer to relevant National Clinical Guideline No. 6 Sepsis

Recommendation 13
The INEWS Escalation and Response Protocol allows for the capacity to escalate care based only on the concern of the 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**
Responsibility for implementation: **Doctors, nurses, health and social care professionals and healthcare assistants.**

Recommendation 14
Patient, family or carer concern is an important indicator for patient deterioration. The INEWS Escalation and Response Protocol allows for the concerns of the patient, family or carer to trigger clinical review ('patient/family/carer concern' criterion).

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses, nurse managers, health and social care professionals, healthcare assistants, clinical directors and Quality & Patient Safety Leads.**

Recommendation 15
The needs and wishes of patients on End-of-Life-Care Pathways and/or 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**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Good practice point
The use of situation awareness to anticipate deterioration is recommended. 'Cues for Caution' to consider when using a situation awareness approach include but are not exclusive to the following:

- Clinician intuition/ "gut-feeling" that the patient is at risk for deterioration.
- High-risk therapies including unfamiliar therapies on a ward or unit.
- Patient or family concern about patient safety.
- Elevated or elevating INEWS score.
- Communication concerns (between healthcare professionals and/or healthcare professionals and patient) that may impact patient safety.
- Patient located outside of specialty area, for example, surgical patient on a medical ward or vice-versa.
- Older person having spent more than twelve hours on trolley awaiting admission.
- Presence of invasive devices for example intravenous catheters, indwelling urinary catheters etc.
- Known colonisation with anti-microbial resistant organisms.

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 in part 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' or '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 standard INEWS *Escalation and Response Protocol* should not be altered.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Good practice point
An exception to this may be for patients undergoing planned procedural care e.g. day cases. Clinically-led local policy should determine best application in these circumstances.

Recommendation 16b
After 24 hours a Registrar or Consultant can modify the standard *INEWS Escalation and Response Protocol* based on a patient's baseline, observations trend, clinical risk factors and INEWS score and document these modifications as a ***modified INEWS Escalation and Response Protocol*** on the INEWS observation chart.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

Recommendation 17
The modified INEWS Escalation and Response Protocol should be reviewed by a Registrar or Consultant doctor every 24 hours and documented on the INEWS observation chart.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

Recommendation 18
A ***modified*** INEWS Escalation and Response Protocol will include at a minimum:

- Rationale for modification of escalation and response
- Timeframe for review of patient and modified response protocol (minimum 24 hourly review)
- Information about further action(s) and/or escalation

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

The modified INEWS Escalation and Response Protocol will be documented on the INEWS patient observation chart using the 'Modified INEWS Escalation and Response Protocol' section an example of which can be seen in Table 7.

Table 7: Example of a Modified INEWS Escalation and Response Protocol

Date/Time (Use 24 hour clock)	Rationale and Instructions/ Interventions	Next medical review	Doctor signature and MRCN
Start date: 05/03/'20 **Start time: 0400**	Imp: Chronic COPD, admitted > 24 hours ago. Stable with RR 22, SpO_2 92%, O_2 2L/min (INEWS score 7). Escalate if change in RR or increased O_2 requirement to maintain SpO_2 treatment target of 92%	Maximum 6 hours (10am) or at ward round or sooner if concern	Dr A, Medical Registrar MCRN 1234567
Start date: 05/03/'20 **Start time: 1000**			
End date: 05/03/'20 **End time: 1000**	Reviewed continue as above.	24 hours or sooner if concern	Dr A, Medical Registrar MCRN 1234567
End date: 06/03/'20 **End time: 1000**			

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

- **Bedside response** (INEWS scores of 0-2): nurse-led, ward-based response. An urgent response can be called for scores of 0-2 if there is clinician concern.
- **Urgent response** (INEWS scores of 3-6): response by a clinician or team with competence in the assessment and treatment of acutely ill patients e.g. primary medical practitioner/team or Advanced Nurse Practitioner service.
- **Emergency response** (INEWS 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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses and health and social care professionals.**

Good practice points

- The NCG No. 1 INEWS V2 advocates a move towards an anticipatory model of care. An anticipatory care approach acknowledges the vulnerability of patients at low and sometimes 'no' INEWS 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 INEWS score. The 3-tiered response model outlined in Recommendation 19 will take some years to achieve nationally.
- While INEWS V2 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 an INEWS 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 21
Clinicians 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 or differential diagnosis.
3. Be able to undertake appropriate initial therapeutic intervention which may include mobilisation of specialist team.
4. Be able to commence stabilisation and maintenance of 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 setting 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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses and health and social care professionals.**

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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

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

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

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.
- Each hospital's local INEWS implementation policy should outline the necessary communication requirements between urgent/emergency responders and the patient's primary medical practitioner/team.
- 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.

Domain 4 – Clinical Communication

The HRB-CICER literature review did not directly investigate clinical communication processes in relation to early warning systems. Evidence to support this domain came from audit, serious incident investigations and focus group findings.

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 settings 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 2017, 2018 and 2019 with nurses, doctors and health and social care professionals working in acute settings 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. The ISBAR3 communication tool should be used for interdepartmental and shift handovers.
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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals, healthcare assistants and Quality & Patient Safety Leads.**

Recommendation 25
Safety huddles should be used as forums where staff/patient/family concerns can be raised and discussed.

Certainty of evidence: ⊕○○○
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Recommendation 26
Following clinical review in response to escalation a plan of care should be clearly documented and verbally communicated.
If a Registrar or Consultant determines that a ***modified*** INEWS Escalation and Response Protocol is required it should be clearly documented on the INEWS observation chart and verbally communicated.

Certainty of evidence: ⊕○○○
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors.**

Recommendation 27
In line with best practice and shared decision-making 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 confidentially.

Certainty of evidence: ⊕○○○
Strength of recommendation: **Strong**
Responsibility for implementation: **Doctors, nurses and health and social care professionals.**

Good practice points

- Refer to relevant National Clinical Guidelines:
  - No. 11 Communication (Clinical Handover) in Acute and Children's Hospital Services
  - No. 5 Communication (Clinical Handover) in Maternity 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/ISBAR3 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.
- Consider HSE's Open Disclosure Policy.

Domain 5 – Leadership & Governance

Review question 1	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?

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?

Review question 5	Why do healthcare professionals fail to escalate as per the INEWS protocol?

Evidence statement

Success and sustainability of the Irish National Early Warning System (INEWS) 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 as a barrier by participants where no standardised or regular training was 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 designate a Consultant Lead and executive sponsor at senior management level with overall responsibility for the ongoing performance and improvement of the INEWS supported by a designated INEWS co-ordinator.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams and senior healthcare professionals.**

**Guidance on the role of the Consultant Lead and INEWS Co-ordinator can be seen in Appendix 14*

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, INEWS, PEWS, IMEWS, EMEWS, Mortality & Morbidity, ICU admissions and discharges etc.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams and senior healthcare professionals.**

Recommendation 30
The Governance Committee should oversee the ongoing performance and improvement of the anticipation, recognition, escalation, response and evaluation elements of the INEWS 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.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, service users and Quality & Patient Safety Leads.**

Recommendation 31
A formal guideline/policy framework for the implementation of the INEWS 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
9. Documentation regulation and management of records
10. Patient and service user involvement.

Local planned variations to the INEWS 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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, practice development, service users and Quality & Patient Safety Leads.**

Recommendation 32
There should be appropriate policies and documentation regarding goals of care to include '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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, practice development, doctors, nurses and health and social care professionals.**

Recommendation 33
Hospitals should support additional safety practices that enhance the INEWS. 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**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior managers, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Good practice points

- The local Consultant clinical lead and INEWS co-ordinator should have designated protected time for INEWS 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 support such as the huddle and situation awareness should be implemented.
- Hospital policy on Advance Directives should be adhered to.

Domain 6 – Education

Review question 3	What education programmes have been established to train Healthcare professionals 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 FIRST^{2}ACT, 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.

Recommendation 34
To improve knowledge, clinical performance and self-confidence in using INEWS it is recommended that INEWS education and training is mandatory for relevant healthcare professionals, that is, nurses, doctors and relevant HSCPs.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, practice development and education providers.**

Recommendation 35
Clinical staff in all acute settings should complete INEWS education and training and maintain their knowledge and skills in INEWS. On induction to an organisation all medical, nursing, HSCPs and HCAs should become familiar with a hospital's INEWS Escalation and Response Protocol.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, practice development and education providers.**

Recommendation 36
Education and training on the use of the INEWS 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 progress this practice.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams and Higher Education Institute (HEIs) partners.**

Recommendation 37
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: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, senior healthcare professionals, HEI partners and continuing education providers.**

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 HSCP students.
- The INEWS Escalation and Response Protocol should be included in education programmes.
- Service providers should collaborate with aligned academic partners to agree the appropriate timing of provision of INEWS education to undergraduate students i.e. so that INEWS education aligns appropriately with clinical placements.
- Education programme learning outcomes can be seen in Table 8.

Table 8: Education programme learning outcomes

Following INEWS education and training *nursing staff* should be able to:

1. Understand and operationalise the INEWS system and the INEWS 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 INEWS education and training *medical staff* should be able to:

1. Understand and operationalise the INEWS system and the INEWS 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 INEWS 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 INEWS education and training *HSCP staff* should be able to:

1. Understand and operationalise the INEWS system and the INEWS 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 INEWS education and training *Healthcare Assistants* should be able to:

1. Understand and operationalise the INEWS 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 INEWS protocol for escalation of care.
5. Listen to patient/family/carer concerns and report appropriately.

Domain 7 – Evaluation, Audit & Feedback

Evidence statement

A systematic review of the literature conducted by HRB-CICER (Clyne et al. 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 2013 National Early Warning System (NEWS) was undertaken in nine acute settings 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 recommended in the NCG No. 1 NEWS (2013), was permitted in eight of the nine NEWS hospital policies (one hospital did not have a NEWS implementation policy). While the eight hospital policies emphasised the importance of a clearly documented management plan with agreed timeframes for parameter 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 No. 1 NEWS (2013).

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 NEWS.

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.

Recommendation 38
INEWS audit data should be collected and reviewed locally by interprofessional teams to inform improvement and patient outcomes.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Recommendation 39
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 INEWS is used.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals and Quality & Patient Safety Leads.**

Recommendation 40
INEWS implementation and sustainability should form part of the hospital's 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.

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, Quality & Patient Safety Lead and service users.**

Recommendation 41
INEWS improvement and sustainability should form part of the Health Service Executive's patient safety and quality improvement strategy. It should be supported through the development and application of a national clinical audit of patient deterioration-related clinical outcomes (e.g. unanticipated cardiopulmonary arrest, unplanned admissions/readmissions to ICU).

Certainty of evidence: ⊕◯◯◯
Strength of recommendation: **Strong**
Responsibility for implementation: **HSE's National Deteriorating Patient Improvement Programme (DPIP), National Quality Improvement Team, Clinical Design and Innovation and Acute Operations.**

Good practice point
Inclusion of data from after action reviews, debriefs and simulations can be used to further identify opportunities for improvement.

Domain 8 – Systems to Support High Quality Care

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 INEWS 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 (Health Innovation Hub Ireland 2019).

Recommendation 42
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 INEWS will help to ensure co-ordinated and effective care for patients whose condition is irreversibly deteriorating.

Certainty of evidence: ⊕○○○
Strength of recommendation: **Strong**
Responsibility for implementation: **Hospital and Hospital Group Boards, Executive Management Teams, doctors, nurses, health and social care professionals, Quality & Patient Safety Leads, service users and Palliative Care.**

Recommendation 43
A move towards a digital INEWS 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**
Responsibility for implementation: **Acute Operations HSE, Office of the Chief Information Officer HSE, Clinical Design & Innovation HSE, National Patient Safety Programme HSE, National Quality Improvement Team HSE, Hospital and Hospital Group Boards and Executive Management Teams.**

Good practice points

Other clinical assessment tools to aid clinical decision-making should be considered in conjunction with INEWS 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.
- 4AT aids the assessment of confusion.
- Modified Rankin Scale (mRS) aids the assessment of disability.

3.2 Summary budget impact analysis

Overview

A systematic review of available evidence identified three studies that investigated the cost-effectiveness of EWSs interventions (Annex 1). A budget impact analysis (BIA) was then performed of the 5-year cost of implementing the National Clinical Guideline, from the health payer perspective. Please refer to Annex 2 (BIA) for full details.

Key findings relating to costs

Four key categories of additional resources were costed:

1. The phased introduction of a 3-tiered Advanced Nurse Practitioner (ANP) responder model (see-recommendation 19) supported by a digital observation recording system.
2. The development of a new eLearning programme, and time for nursing, medical, physiotherapy and healthcare assistants in the 41 acute hospitals to undertake this training.
3. Future development of competency-based education programmes for urgent and emergency care responders.
4. Protected time for Deteriorating Patient Consultant champions.

The total direct implementation cost over a 5-year cycle ranges between €17.2 to €21.8m (Table 9). Of this the majority consists of opportunity costs (15.3 million) that is time staff divert from their typical activities to undertake eLearning modules or duties as a deteriorating patient Consultant champion. The opportunity costs account for the majority (70-89%) of the estimated costs over a five year time horizon. The costs of new posts and equipment (€1.8 million to €6.5million) include funding for the first three years of the ANP response system (a business case for which was submitted to the HSE funding process in 2019) and the cost of the eLearning module which has already been developed. The remaining additional costs (further roll out of ANP response system and a dedicated post to support the development of competency based training) will occur in years 4 and 5 of the time horizon and are associated with a high level of uncertainty.

Key findings relating to benefits

A systematic review of available evidence identified three studies that investigated the cost-effectiveness of EWSs interventions. These included one health technology assessment (HTA) on the implementation of an electronic NEWS, one BIA as part of the NCEC NCG No. 1 (NEWS 2013) and one costing study. Two studies were conducted in Ireland, and one in the Netherlands. Two of the studies included the NEWS, and one included the implementation of a rapid response system. The populations included acute adult inpatients, acute medical patients, and surgical patients. Hospital or intensive care unit (ICU) length of stay (LOS) were the key clinical outcomes included. The studies included suggest that EWSs have the potential to improve patient outcomes including ICU and hospital LOS and thus reduce health care costs. However, as NEWS is in place within the health system the additional benefit that will be gained through the implementation of this guideline is unclear and no direct cost savings were included within the BIA. However, the evaluation of the demonstrator site which will consider the impact on outcomes will provide further evidence within the Irish system.

Table 9: Total estimated costs of implementation of guideline recommendations over a 5-year time horizon.

Cost (€)	2020	2021	2022	2023	2024	Total
ANP response system *Scenario 1 – Scenario 3	€443,492	€251,899	€ 291,101	€259,349 - €615,855	€268,518- €4,523,711	€1,583,513 -€6,195,211
eLearning module development & training for all staff	€3,129,262	-	-	-	-	€6,170,574
Development of competency-based training	-	-	-	€86,591	€86,591	€173,182
Protected time for Deteriorating Patient Consultant champions	€1,857,493	€1,857,493	€1,857,493	€1,857,493	€1,857,493	€9,287,463
Annual total costs (Scenario 1 – Scenario 3)	€5,464,824	€2,143,968	€2,148,593	€5,244,74- €6,601,251	€2,212,602- €6,467,794	-
Total costs for 5 years (Scenario 1 – Scenario 3)	**€17,214,732 - €21,826,431**					

Decisions on the national roll out of the 3-tiered Advanced Nurse Practitioner response model will be dependent upon the evaluation of the demonstrator site. There are three possible outcomes following the evaluation of the demonstrator project, which are treated as three separate scenarios.
Scenario 1: No further roll out after evaluation of the demonstrator site
Scenario 2: Rollout of ANP response model without digital INEWS
Scenario 3: Rollout of ANP response model with digital INEWS.

4 Appendices

Appendix 1: INEWS* 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 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.

g) There may be a requirement to establish various working groups to advance actions as guideline development progresses. The Chair of the working group will report to the GDG on progress and outputs and seek further advice or decisions where appropriate.

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

INEWS 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

**NEWS became INEWS (Irish NEWS) to distinguish it from EWSs in use in other jurisdictions. List of GDG members can be seen in Table 1.*

Appendix 2: National Deteriorating Patient Recognition and Response Improvement Programme (DPIP) Steering Group

Name	Discipline
Avilene Casey (Chair)	National Lead, Deteriorating Patient Recognition and Response Improvement Programme (DPIP)
Miriam Bell	Project Lead, NEWS Guideline Revision, DPIP
Fiona McDaid	Nurse Lead, National Emergency Medicine Programme
Louise Hendrick **Eve O'Reilly** **Enda Holohan**	NCHD Representative
Cora McGaughan	Assistant National Director Healthcare Audit Quality Assurance &Verification Division
Richard Walsh	Director of Nursing, National Acute Medicine Programme
Philip Crowley	National Director Quality Improvement Division
Colm Henry	National Clinical Advisor and Group Lead, Acute settings Division
Elaine Browne	Project Manager Office of National Clinical Advisor and Group Lead Acute settings Division
Sinead Horgan	ADON Sepsis, S/SWHG
Ronan O'Cathasaigh	Project Lead, Education Workstream, DPIP
Dorothy Breen	Consultant Anaesthetist, CUH
Mary Brosnan	Director of Midwifery, National Maternity Hospital, Holles Street
Derek Cribben	Nurse Lead, National Critical Care Programme
Paul Ridgeway (until 2019) **Patricia Morrison (2019 onwards)**	Consultant Surgeon, AMNCH
Gerard McCarthy	Clinical Lead, National Emergency Medicine Programme
David Vaughan	Director of Quality & Patient Safety, Children's Health Ireland
Jean Kelly	Chief Director of Nursing & Midwifery, Saolta University Healthcare Group
John Fitzsimons	Consultant Paediatrician, OLOL, Drogheda and Clinical Lead NCP Paediatrics
Andrea McGrail	Director of Nursing & Midwifery Mayo University Hospital
Christina Doyle **Ciara Hughes**	Programme Manager, Sepsis Programme (to April 2019) Programme Manager, Sepsis and DPIP Programmes (from April 2019)
Damien Douglas	Patient Representative
Moira Skelly	Patient Representative
Rosemary Kratschmar	Patient Representative
Maria Donnelly	Consultant Anaesthetist, AMNCH, Tallaght
Peter O'Toole	Advanced Nurse Practitioner, National Clinical Programme for COPD
Gareth Clifford	Quality & Patient Safety, Acute settings Division
Fergal Hickey	Consultant in Emergency Medicine Sligo General Hospital
Professor Garry Courtney	Clinical Lead National Acute Medicine Programme
Jamie Logan	Nurse Lead National Clinical Programme in Surgery
Karen Power	National Project Manager Irish Maternity Early Warning System
Michael Power	Clinical Lead National Critical Care Programme
Vida Hamilton	NCAGL Acute Hospitals
Mary Flynn	Programme Manager National Emergency Medicine Programme
Sheila Sugrue	Director of Midwifery, Office of Nursing & Midwifery Services Director

Appendix 3: INEWS Consultant Advisory Group (CAG) Membership

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

Appendix 4: Letter of invitation to INEWS CAG members from Chief Clinical Officer HSE

Office of the Chief Clinical Officer
Dr Steevens' Hospital
D08 W2A8
E: cco@hse.ie
Oifig an Phríomhoifigigh Chliniciúil Eatramhaigh
Feidhmeannacht na Seirbhíse Sláinte
Seomra 1.01 | Ospidéal Dr. Steevens | Baile Átha
Cliath 8 | D08 W2A8

By Email Only
From: Dr Colm Henry, Chief Clinical Officer
To:
Re: Consultant Advisory Group INEWS.
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 INEWS 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 INEWS 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 5: Implementation Plan

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
All recommendations all Domains	**Enablers:** Engagement • Stakeholder engagement • Patient engagement and involvement	Develop and roll-out a communication and dissemination, including public engagement. Recommend further development of patient/family/carer empowerment options	Deteriorating Patient Improvement (DPIP) team Hospital executive management teams each acute hospital	X X	X X	 X	**Outcome:** Improved awareness and knowledge of guideline **Verification:** Records of dissemination activities. Evidence of the adoption of INEWS. Patient/ family/carer escalation process developed and adopted.
	Enablers: Governance and QI • Deteriorating Patient Governance Group • Clinical Champions to support practice and clinical governance • Application of Quality Improvement methodologies to improvement projects • Local and national audit.	Improve Hospital Deteriorating Patient Governance structure. Use data from outcome indicators to guide improvement projects Further Consultant engagement to identify medical champions to fulfil key governance roles. Essential to provide designated time to consultant lead. Quality improvement leads/project co-ordinators to use outcome and audit data to drive improvement in INEWS Practice development leads, Resuscitation officers to use information from governance group to inform practice improvements.	Hospital executive management team. Clinical Director and Director of Nursing in each acute hospital Quality & Patient Safety and Risk Management leads in Hospital Group/ Hospital	X X X X	X X X X	X X X X	Outcome: This clinical governance framework will enable a safe devolved accountable system. Create a Clinical champion network to evolve practice and critical clinical decision making in relation to INEWS Verification: Clinical audit of e.g. In Hospital Cardiopulmonary Arrest, Unplanned admissions to ICU. Evidence of clinical leadership displayed through audit, research, improvement projects, national conferences. Records of actions taken by INEWS governance committee. Evidence of INEWS QI projects.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
	Enablers: Education • Provision of and access to Education and training • Development of support tools	Develop an open access eLearning programme for INEWS and a supporting manual and tools Hospitals to provide local onsite education and training Standardised tools for dissemination and local empowerment to development specific tools based on their own need Identification and development of specific skills and competencies for staff on response teams Education for safety improvement e.g. safety huddles, use of clinical risk criterion.	DPIP On site Practice Development Centres for Nurse & Midwifery Education Deteriorating Patient Response Team members Quality Improvement (QI) and Risk Management leads	X X X X X	X X	X	**Outcome:** Staff will have the capability to deliver the necessary service **Verification:** Staff participation in the programmes on offer. Evidence of the development and application of support tools **Outcome:** Competent response teams **Verification:** Response teams with clear roles and responsibilities **Outcome:** Penetration into service **Verification:** Evidence of safety huddles in use
	Enabler: Service design Development of ANP Response Service	Initiate a demonstrator project on an acute hospital site – ANP response team for urgent response model, supported by a digital INEWS to aid recognition and escalation. Measure patient outcome data to determine improvement in patient safety and outcomes. Report on learning regarding leadership, governance, integration, practice development and communication.	Chief Clinical Officer (CCO) DPIP Hospital management team of chosen site. Office of the Chief Information Officer (OoCIO), Biomedical and IT team on site. Clinical Director and Director of Nursing/ delegate's. Healthcare professionals with responsibility for policy and/or QI	X	X	X X X	**Outcome:** Evidence to determine the most appropriate and effective recognition and response model to ensure patients receive right care right time right staff. Define appropriate outcome measures. **Verification:** Measure outcome data related to e.g. in hospital cardiopulmonary arrest, unplanned admission and readmission to ICU, patient access to end of life care pathway. Agreement on roles and responsibilities.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
	Enabler: E Health Plan and progress towards the use of digital monitoring and recording systems	Develop procurement tender documents for the purchase of digital system to use on demonstrator site Implement digital monitoring and recording system(s) Make digital system tender document available to other sites. Share learning with other sites	DPIP, OoCIO, CCO Project team on site	X X X	X X	X X	**Outcome:** Promote and advance the use of digital monitoring recording and alert systems to improve patient safety **Verification:** Use of data from the digital system to improve patient outcomes, generate reports drive audit and research. Staff proficiency in the use of the digital system. Improved compliance with INEWSs Activity data of the Response team. Reduction in IHCA, ICU Admissions
	Enabler: Communication Create a communication plan that engages all stakeholders and creates new awareness	Develop and disseminate information guides. Ensure the new guideline available in a variety of mediums, hardcopy electronic, web link Create an easy recognisable brand for INEWS and supporting tools Encourage staff to generate publications and posters	DPIP, HSE communications Patient Safety – DOH, HSE, CIS, HIQA. Hospital Management Teams Acute Operations HSE	X X X X	X	X	**Outcome:** Educate HSE staff on INEWS and create public awareness. **Verification:** INEWS similar to Sepsis awareness is visible within societal structures e.g. social media; traditional media, service users use it to raise concern or enquiry.
	Enablers: Resources • Demonstrator project for digitally supported ANP response team funded • Clinical Champions	Initiate demonstrator project. Measure outcomes. Share learning Designated time allocated to Clinical champions to establish and lead INEWS governance framework	CCO DPIP Designated Project management team Health service managers. Health professionals with responsibility for policy patient safety and QI.	X X	X X	X	**Outcomes:** Data and evidence to inform service plan and delivery of appropriate response model **Verification:** Evidence based on international experience, project site experience. Patient outcome data based on agreed indicators. Agreed role and responsibilities for Clinical champion. Establishment of governance committee.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
	Barriers: Requires effective change management, resourcing, digital applications, audit & clinical leadership	Resource approval from INEWS programme sponsors for implementation of INEWS Maintain programmatic implementation approach through DPIP	CCO, Acute Operations, Quality Assurance & Verification (QAV), QI, OoCIO, DPIP, Hospital Groups Acute Hospitals	X	X	X	**Outcome:** Mandate and resources for implementation secured **Verification:** Targeted budget allocation. Inclusion in HSE National Service Plan, Patient safety strategy and National QI team Strategy. Governance groups established at hospital level
Measurement and Documentation of Vital Signs and Other Observations Recommendations 1 – 9	**Enabler:** Redesign of the INEWS Chart according to human factors principles	Co-design with frontline service staff an updated INEWS chart inclusive of the escalation and response guide template	DPIP team Doctors, nurses, health and social care professionals, healthcare assistants	X			**Outcome:** Improved use of track and trigger tool i.e. Observation chart **Verification:** Audits (Nursing Quality Care metric) and HSE KPIs Focus group feedback.
	Enabler: NEWS education and communication packages	Include measurement/ documentation as part of blended learning education approach. Ensure a focus on clinical judgement is contained within the education programmes and in other communication mediums	DPIP team	X	X		**Outcome:** Improved measurement and documentation **Verification:** Audits and KPIs Use of case studies to enhance learning. Use of scenario based learning sets.
	Enabler: Adoption of new recommendations based on evidence and feedback	Inclusion of new 'confusion' into AVPU scale Inclusion of acknowledgement of Patient/Family/ Carer concern row on observation chart	DPIP Doctors, nurses, health and social care professionals, healthcare assistants	X			**Outcome:** Improved recognition of deterioration/delirium Acknowledging the key role service users play in the recognition of deterioration. **Verification:** Audit, Patient outcomes

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
	Barriers: Absence of digital monitoring and recording systems	Establish a demonstrator project using an INEWS digital system to record and escalate supported by an ANP response team	CCO Acute Operations, OoCIO DPIP Executive management team of demonstrator project site Doctors, nurses, health and social care professionals, healthcare assistants	X	X	X	**Outcome:** Learning from demonstrator project will inform phased service planning and implementation to other acute hospitals. Evaluated Procurement documents for digital system available for use **Verification:** Patient outcomes measured, and improvements identified
	Barrier: Lack of application of escalation and response protocol.	Ensure ease of recording and visibility of documented modified escalation and response protocol within the observation chart Provide education to healthcare professionals on the significance of adhering to recommendation 7 (No alteration of score or parameters)	DPIP team. Doctors, nurses, health and social care professionals, healthcare assistants Practice development. Educators. Governance committee	X	X	X	**Outcome:** Improved measurement and documentation **Verification:** Audits and KPIs. Incidents of failed escalation used as teaching and improvement opportunities. Feedback on audit results to frontline staff.
Escalation of Care Recommendations 10 – 15	**Enabler:** Consensus from expert Consultant Advisory Group (CAG) regarding the escalation and response model	Develop a consensus on guidance for the escalation and response to clinically deteriorating patients inclusive of position on Parameter Adjustment, Trigger Thresholds and tiered Response System	Consultant Advisory Group (CAG) Guideline Development Group (GDG) DPIP team CCO Hospital Groups Doctors, nurses, health and social care professionals	X			**Outcome:** Consensus on revised guidance on Parameter Adjustment, Trigger Thresholds and tiered Response System **Verification:** Recommendations within revised guideline are adopted and penetrate into the service setting

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
	Enabler: Hospital escalation and response model tailored to the characteristics of the site	Acute hospitals to include consideration of issues such as; Model of hospital, location, available resources e.g. staffing mix and skills, equipment, external transport access.	Hospital management team/ Board Governance committee Doctors, nurses, health and social care professionals	X	X	X	**Outcome:** Hospital Clinical escalation and response protocol (with built-in review) available to the workforce. **Verification:** To change practice and improve health systems health professionals and hospital management need to determine who will take responsibility for undertaking the tasks required for this essential element.
	Barriers: • Current practice of Parameter and trigger thresholds adjustment • Limited experience, confidence and education • Hierarchical Hospital Structures and culture • Inadequate involvement of patients/carers/ families	Provide acute hospital system-wide communication and education regarding revisions in the guideline to target specifically • Empowerment to use clinical judgement • Recognition of and escalation on patient/carer/ family concern • Appropriate use of modified escalation and response protocol Through QI projects implement situation awareness supports e.g. safety huddle/ safety pause/ "watcher criteria", clinical risk criteria. Develop and implement patient/ family/carer escalation process.	DPIP Hospital NEWS Governance Groups, On-site Practice Development, Resuscitation Officers Doctors, nurses, health and social care professionals, healthcare assistants	X X X	X X X	X X X	**Outcome:** Evidence of escalation based on staff and patient/ carer/family concerns. Documented evidence of cessation of the practice of parameter and NEWS score adjustments Documented evidence of the appropriate use of modified escalation and response protocol. Aids to support situation awareness embedded in practice **Verification:** Healthcare audit, clinical audit. QI projects on sites to develop safety huddles/pause etc

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
	Barrier: Currently limited INEWS/ EWS governance structure, minimal Consultant and senior medical engagement	Provide a clinical governance framework to support the adoption and improve the fidelity and penetration of INEWS.	DPIP Hospital Board and Executive Management Teams Clinical Director, doctors, nurses, health and social care professionals	X	X		**Outcome:** Hospital INEWS governance group with direct reporting to senior executive management team. Consultant lead with designated time, and agreed roles and responsibilities supported by designated INEWS co-ordinator. **Verification:** Terms of reference for Governance committee, Minimum of quarterly Governance group meetings Regular progress reports containing patient outcome data and action plans, evidence of 6 monthly reports to the Board/Executive Management team. CDI annual report to Board of HSE
	Barriers: • Change of practice in majority of sites • Resource requirements • Skills shortages • Ownership and clinical governance	Develop an Urgent/ Emergency ANP Response Team Model. Fund a demonstrator project to provide proof on concept in an Irish context Provide guidance to sites progressing development of tiered response model.	CCO, Acute Operations, DPIP, CAG, Demonstrator site Doctors, nurses.	 X X	X X	X X	**Outcome:** Improved understanding and guidance on how to implement an ANP Response Team Model **Verification:** Framework document based on measurement of patient outcomes, roles and responsibilities, governance and leadership, "ownership" challenges, reporting and clinical handover and governance.
		Hospital service planning to embed and resource ANP Response Team Model	Hospital management teams			X	**Outcome:** ANP Response Team Model widely embedded in services **Verification:** Audit and KPIs, Clinical Outcome Data, Learning from demonstrator sites

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
Response System Recommendations 16 – 23	**Enabler:** Agreed Tiered Response System and ANP Response Team Model	Develop 1. tiered response and 2. ANP response team model demonstrator project plan with steering group (SG) and CAG (yr 1) and designated demonstrator site.	DPIP CCO & CAG Acute Operations Hospital Group, hospital site Doctors, nurses, health and social care professionals	X	X	X	**Outcome:** ANP Response Team model framework developed. Governance for response team, clear lines of clinical responsibility between response team(s) and primary teams. Project committee and hospital executive level support established and functioning **Verification:** Project reports, patient outcome measures, guidance framework
	Barrier: Lack of resources and interprofessional differences/ boundaries	Endorsement by national corporate leadership to support effective change management, resourcing, clinical leadership and education Support and evaluate ANP response model on demonstrator sites and other self-led change sites	HSE leadership team, CCO, DPIP Acute Operations, Hospital Groups, Hospital site Doctors, nurses, health and social care professionals	X	X	X	**Outcome:** Demonstrator sites initiated and evaluated. **Verification:** Future model agreed and evident in service planning and development. **Outcome:** Guideline implementation prioritised by HSE national leadership team **Verification:** Inclusion in National Service Plan, Patient Safety Strategy, QI Strategy, KPI reports, Plan for clinical audit reporting
	Barrier: Not all acute hospitals have well-co-ordinated processes or resources in place to provide the recommended tiered response model.	Through each hospital's established formal INEWS (EWS) governance committee a plan to provide a tiered urgent and emergency response system capable of delivering specialised timely assistance to clinically deteriorating patients	Acute Operations, Hospital Group Boards/Executive management teams, hospitals Doctors, nurses, health and social care professionals	X	X	X	**Outcome:** Reliable effective tiered response model in alignment with the guideline recommendations. **Verification:** Documented evidence of the nature of the response system appropriate to the size, role, resources and staffing mix and skills. Designated protected time for the clinical lead to oversee development of plan and system.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
Response System Recommendations 16 – 23	**Barrier:** Understanding roles and responsibilities of ANP Response Team Model	Discuss and present on model at various fora Incorporate messaging/linked terminology into communication plan Meet with individual sites to explain the model and provide guidance.	DPIP, ANPs currently in the acute hospital system on response teams ONMSD/NMPDUs	X	X	X	**Outcome:** Improved understanding of ANP Response Team Model, **Verification:** communication materials
Recommendations 16, 17, 18	**Enabler:** New documentation process to aid individualised care protocol **Barrier:** Change from the current practice	INEWS chart will provide space to record modified escalation and response protocol. Hospital INEWS Governance committee to oversee implementation through evaluation, case review, audit, incident reviews.	DPIP Doctors, nurses, health and social care professionals, healthcare assistants INEWS Consultant Lead, designated INEWS co-ordinator, Quality & Patient Safety Lead	X			**Outcome:** Appropriate individualised modified escalation and response protocol. Abandonment of the current practice of adjusting scores and parameters. Safety processes on the ward should identify patient on a modified escalation and response protocol. **Verification:** Evaluate modified protocols for effectiveness and appropriateness. Compliance with the 24hr review of a modified escalation and response protocol. Evidence on audit of cessation of practice of score or parameter adjustments.
	Enabler: Education and training to support development of capacity and capability of response teams	Utilise and promote available life support education programmes. Identify skills and competencies required for responders in the 3 tier response model. Access at all times to a healthcare professional who can practice advanced life support.	DPIP, Response team ANPs INEWS Consultant Leads, INEWS co-ordinators, educators, Resuscitation Officers. Doctors, nurses, health and social care professionals	X	X	X	**Outcome:** Education and training available to staff via a variety of access routes **Verification:** Education audits and records. Development of skilled teams. Training needs analysis and plan to improve uptake of training.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
Clinical communication **Recommendations 24, 25, 26**	**Enabler:** Strengthening of the use of communication tools e.g. ISBAR/ ISBAR3 tools, safety huddles aligned to clinical handover guideline **Barriers:** • Cultural, hierarchy and lack of compliance and knowledge • "not regarded as essential" • Lack of written communication • Patchy implementation of clinical handover guideline	Deliver education and tools to improve adoption of ISBAR tool and ISBAR 3	DPIP QI Team QAV Doctors, nurses, health and social care professionals INEWS Consultant Lead, designated INEWS co-ordinator, Quality & Patient Safety Lead	X	X		**Outcome:** Standardised effective communication **Verification:** Audit, Development and implementation of support tools e.g. use of ISBAR sticker. Use of clinical risk criterion and INEWS scores at safety huddle/clinical handover
		QI Sustainability Team Partnership to determine if possible, to develop national QI bundle for NEWS improvement. Co-design with post QA&V 2017/18 audit sites and patient representatives	DPIP QI Sustainability Team QAV	X	X		**Outcome:** INEWS QI Improvement Bundle **Verification:** QI projects. Delivery of QI education programmes Measurement for QI evident.
		Awareness of the INEWS guideline through its alignment with the Patient Safety Strategy and national QI Team Strategy.	Quality & Patient Safety Lead Hospital Senior Management Teams Doctors, nurses, health and social care professionals	X			**Outcome:** Improve recognition of the role of INEWS in patient safety **Verification:** Improved patient outcome measures. Improved KPI reports
Recommendation 27		Link implementation structures for clinical handover guideline to INEWS	Hospital Quality & Patient Safety Lead INEWS Consultant Lead INEWS co-ordinator	X	X	X	**Outcome:** Evidence of use of ISBAR and ISBAR 3 **Verification:** Healthcare audit. Review of case notes, clinical incidents.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
	Barrier: It is a complex process knowing how to effectively communicate with patient/family/carer	Patients/family/ carer should be involved in processes to improve communication about clinical deterioration. Use QI projects to evolve patient /family/ carer communication systems and practices Explore synergies with other patient engagement programmes/ projects Emphasise patient/ family/carer engagement, communication and co-production in education and training programmes. Align INEWS guidance with End of Life/ Palliative Care guidance	DPIP Clinical Champions, Practice Development Palliative Care teams Doctors, nurses, health and social care professionals Quality & Patient Safety Lead	X	X	X	**Outcome:** Enhanced patient/family/ carer engagement and communication structures, tools, access. **Verification:** Audit, patient experience, complaints, incidents.
	Barrier: System wide scepticism about the need for patient engagement with INEWS/ deterioration **Enabler:** Patients/family/carer bring insights about their experiences of receiving care	Gather evidence relating to current communication processes with patient/family/ carer. E.g. process map current process and complexity. Forums established to explore with patients/family/ carer as to how their concerns about deterioration can be valued and acted upon by clinicians	Clinical Champions, Practice Development Palliative Care teams Doctors, nurses, health and social care professionals Quality & Patient Safety Lead Risk management	X	X	X	**Outcome:** use patient stories, incidents of missed opportunity and examples of when things worked well to inform process improvement. **Verification:** Visible evidence of efforts to improve processes, posters, documented guidance, patient feedback, patient representation on relevant groups/ committees.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
Leadership and Governance **Recommendations 28 – 33**	**Enabler:** • Clinical Leadership of all disciplines • Executive management support	Co-design appropriate clinical governance framework for INEWS implementation and evaluation. Each hospital to convene an INEWS governance committee with a consultant/ champion lead and designated INEWS co-ordinator. Develop role and responsibility guidance specifying what is expected of clinical leaders for INEWS.	Doctors, nurses, health and social care professionals INEWS Consultant Leads and INEWS co-ordinators, DPIP Hospital Groups Clinical leaders Acute Operations, QI	X	X	X	**Outcome:** Full implementation of INEWS and improved clinical outcomes. **Verification:** Audit and KPIs. **Outcome:** Greater clarity on role of the clinical leaders and consultant lead. **Verification:** Role and responsibility guidance produced
	Enabler: There are a number of EWS and supporting resources currently within hospitals	The hospital should seek to align governance processes for other EWSs within their remit e.g. IMEWS, PEWS, EMEWS, Sepsis, Mortality and Morbidity, ICU Clinical audit, Resuscitation committee/service.	Doctors, nurses, health and social care professionals Hospital Groups, hospital management teams, Clinical leaders Resuscitation Officers, Sepsis leads, INEWS co-ordinators	X			**Outcome:** Agreed reporting lines to ensure performance and outcome data is considered by clinicians, managers and executive management teams. **Verification:** System wide improvement planning and alignment of EWS and patient safety programmes, Clinical programme guidance and QI projects.
	Barrier: Clinical consultant champions require resourcing	Corporate and hospital support and resourcing to provide consultant champions with the time and supports to • Measure and evaluate data • Provide clinical mentorship, governance and education • Lead improvement projects • Engage in ongoing education, research, audit • Secure meaningful patient engagement	Acute Operations Hospital Groups Hospital Consultants			X	**Outcome:** Guideline implementation adequately consultant driven and resourced at hospital level **Verification:** Organisation support for improvement plans. Evidence of systematic continuous efforts to improve the organisations INEWS performance against INEWS guideline and international best practice standards.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
Education Recommendations 34, 35, 36	**Enabler:** Review, redesign and update of education programme	Co-design and produce a blended learning education programme - e-learning module, Promote and enable simulation and face to face engagement with different MDT disciplines (e.g. teaching opportunities on site) Hospitals to liaise with their academic partners to provide INEWS education on the relevant undergraduate programmes.	DPIP Practice Development, CNMEs NMPDUs HEIs Doctors, nurses, health and social care professionals Hospital Executive Management Team	X X	X		**Outcome:** Improved knowledge and skills in correct use of INEWS. Evidence of correct use of: Track and trigger tool (chart), escalation and response protocol, application of skills and competencies to tiered response model, use of ISBAR, ISBAR 3 Evidence of the use of clinical judgement, growing use of situation awareness and relevant tools i.e. safety huddles etc. **Verification:** Participation records. Provision of in hospital programmes. Improved access to education programmes online and face to face.
	Barriers: • Nonattendance or unidisciplinary attendance • Limited access /resources for staff participation on education programmes	INEWS KPI set an expectation of 85% of hospital relevant staff participating in training. Education programme made relevant to participating staff groups	Hospital Senior Management Teams (SMTs) Hospital Groups Acute Operations DPIP CNME Human Resources	X	X	X	**Outcome:** Education programme available to all disciplines Staff educated in correct use of INEWS **Verification:** Participation records. Improvement in compliance and application of tools evident in audits
Education Recommendation 37	**Enabler:** The ANP response team demonstrator project will establish relevant skills and competencies	DPIP will co-produce with the clinical leads on the demonstrator site and other sites initiating ANP response models a skills and competencies framework for urgent response model. Align programme to existing models e.g. RCSI's CCrISP programme.	DPIP Doctors, nurses, health and social care professionals ANPs NMPDUs Consultant leads National Clinical programmes			X	**Outcome:** Skills and competency Framework for ANP response team Skills and competencies identified for all tiered response model responders (interprofessional). Project to develop a skills education programme. **Verification:** Published skills and competencies framework document. Project to develop education and training for responders established

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
Evaluation and Audit **Recommendations** **38, 39, 40, 41**	**Enablers:** • Alliance with QAV and NOCA • Use of Health intelligence NQAIS clinical outcome data • Quality Improvement projects in hospitals • Quality improvement and EWS conferences **Barrier:** Resources	Propose and agree a HSE QAV Audit Schedule Conduct a feasibility study with NOCA to determine if a combined Deteriorating Patient and In Hospital Cardiopulmonary Arrest clinical audit is deliverable. Align other Clinical Audit Reports e.g. Sepsis, ICU admission to improvement plans. At a minimum establish a National In-Hospital Cardiopulmonary Arrest Clinical Audit	CCO, Clinical Design & Innovation (CDI) QAV DPIP Acute Hospitals Health Intelligence Business Intelligence unit NOCA Key stakeholders Doctors, nurses, health and social care professionals	X	X	X	**Outcome:** Established audit schedule & Outcome Agreed outcome indicators **Verification:** QI projects based on audit results. Reports produced. Improvement plans with responsibilities and timelines agreed, implemented and evaluated.
		Review and collate national and local data collection sources (e.g. quality care metrics, audit data, HIPE) to explore their potential for use in guideline monitoring, audit and evaluation	DPIP Hospital sites NOCA	X	X	X	**Outcome:** Improved use of data for QI **Verification:** Reports published. Audit schedule.
	Enabler: A feasibility study of developing and implementing a combined clinical audit of the deteriorating phase and unanticipated cardiopulmonary arrest has been initiated. **Barrier:** Resources and ongoing funding	In order to drive system wide improvement in INEWS and associated outcome measures at a minimum a national clinical audit for In Hospital Cardiopulmonary Arrest should be established under the auspices of NOCA	CCO, Clinical Design & innovation DPIP NOCA		X	X	**Outcome:** System wide improvements in the operationalisation of INEWS. **Verification:** National Clinical Audit in place and reports generated. Reports used to drive improvement supported by QI measures.

Appendix 5: Implementation Plan (continued)

Guideline recommendation or number(s)	Implementation barriers / enablers	Action / intervention / task to implement recommendation	Lead responsibility for delivery of the action	Timeframe for completion			Expected outcome and verification
				Year 1	Year 2	Year 3	
Systems to Support High Quality care **Recommendations** **42 and 43**	**Enabler:** Number of natural alignments of INEWS with other patient safety resources and programmes	National and local health service organisations should seek opportunities to align their systems to support improvement in the anticipation, recognition, escalation, response and evaluation of clinically deteriorating patients as well as with other related clinical care programmes e.g. EOLC	CDI QAV, National QI Team, National Clinical Programmes, Education providers, Key stakeholders. DPIP	X	X	X	**Outcome:** System wide INEWS, patient safety improvement. Patients requiring treatment limiting decisions identified **Verification:** Co-ordinated effective care. Improvement in key outcome measures. Further improvement and development in INEWS. Greater access to end of life pathways.
	Enabler: Track and trigger tool is well established in all acute hospitals **Barrier:** prohibitive cost of digital system. Staff reluctance to use a digital system	Improvement in INEWS has reached a plateau and only minimal gains in compliance with recognition and escalation can be achieved with manual records. In line with other jurisdictions the HSE and hospitals should incorporate into service plans a digital observation monitoring, recording and alert system i.e. Digital INEWS	CCO, OoCIO, Acute Operations DPIP Executive management teams of hospitals, Doctors, nurses, health and social care professionals Biomedical engineers			X	**Outcome:** Reliable efficient recording of observations, escalation of care. Improved patient welfare. Reduction in missed opportunities to provide care. Support resource for frontline staff. Direct impact on patient safety. **Verification:** Digital system reports on accuracy of recording and alerts. Staff confidence in use of the system.

Implementation of overall guideline

While the implementation plan is specific to recommendations contained within the domains of the guideline, some actions will assist with guideline implementation as a whole. These include establishing an INEWS governance committee with designated implementation responsibilities; developing a dissemination and communication plan and designing or availing of specific implementation tools and resources

Implementation team:

- National Team - DPIP/CDI National Lead, Programme Manager, Project Leads x 3 workstreams (guideline revision, education and service improvement), administrative support. Steering Group – meeting twice a year. Working groups for workstreams – dependant on progress, usually monthly at a maximum. DPIP team meetings – fortnightly. Demonstrator project (once established) – fortnightly initially then monthly.
- Hospital Level - INEWS Governance Committee membership,(hospitals should consider aligning all Early Warning Systems, Sepsis, Resuscitation, Morbidity & Mortality etc) Example of membership of the governance committee; to include executive lead sponsor, Consultant lead/champion, designated INEWS co-ordinator, doctors, nurses, health and social care professionals, education leads for healthcare professionals and members of the hospital Quality & Patient Safety leads, QI team and or risk manager, resuscitation officer, critical care representative, sepsis lead, EWS leads. Quarterly meetings as per local policy. In partnership with QI sustainability team provide access to QI training for local teams. Local INEWS co-ordinators to facilitate the delivery of education sessions as required.

Dissemination and communication plan:

- Literature review and BIA
- Communication / Marketing: DPIP Website / DPIP Email Account / Twitter / Flyers / Infographics/ local hospital newsletters/intranets/ National conferences e.g. Patient Safety Conference,
- Organise an inaugural Deteriorating Patient conference for Ireland
- Seek to host the International Society for Rapid Response Systems (iSRRS) conference in Ireland
- Case scenarios to be used in education
- Communicate with hospitals on their key responsibilities and expectations e.g. all staff to have protected time to participate in education, review and improvement of governance, embed in existing forums/meetings, journal clubs, grand rounds etc.

Key communication messages:

- Shift from a score to a system
- Unanticipated cardiopulmonary arrest is a patient safety issue – aim is to eliminate preventable deaths from unrecognised deterioration
- INEWS is an adjunct to clinical judgement
- Situation awareness contributes to an environment which enhances patient safety
- Patient/family/carer engagement, communication, and escalation are essential to effectiveness
- Aim is to provide safe, efficient, reliable care.

Appendix 6: INEWS 2020 Patient Observation Chart

Deteriorating Patient Improvement Programme

Tús Áite do Shábháilteacht Othar / Patient Safety First

Patient Name: _____

Date of Birth: _____

Healthcare Record No: _____

Irish National Early Warning System (INEWS)

ADULT PATIENT OBSERVATION CHART

INEWS should be used as an aid to clinical judgement and decision making

INEWS Escalation & Response Protocol

	INEWS Score	Minimum Observation Frequency	Escalation	Response
Bedside Response	Healthcare worker / patient / family concern	As indicated by patient condition	Nurse at the bedside / Nurse in Charge (NiC)	• NiC to review if concern and escalate as appropriate
	0 – 1	**6 hourly** (first 24 hours following admission) **then 12 hourly minimum**	NiC	• NiC to review if new score 1
	2	**6 hourly**	NiC	• NiC to review
Urgent Response	For INEWS scores of 0 – 2 an Urgent Response (SHO or ANP Service) can be called if there is clinical concern			
	3	**4 hourly**	NiC and Team / On-call SHO	• SHO or ANP service to review within 1 hour
	4 - 6 THINK SEPSIS*	**1 hourly**	NiC and Team / On-call SHO	• SHO or ANP service to review within ½ hour • Screen for Sepsis* • If no response to treatment within 1 hour, contact Registrar and/or ANP service • Consider continuous patient monitoring • Consider transfer to higher level of care
Emergency Response	**≥7**	**½ hourly**	NiC and Team / On-call Registrar Inform Team / On-call Consultant	• Registrar / Consultant / ANP service to review immediately • Continuous patient monitoring recommended • Plan to transfer to higher level of care • Activate Emergency Response System (as appropriate to hospital model)
	Score of 3 in any single parameter or **Score of 2 for HR ≤40**	**½ hourly** or **as indicated by patient condition**	NiC and Team / On-call SHO	• SHO or ANP service to review immediately • If no response to treatment or if still concerned, contact Registrar/Consultant • Consider activating Emergency Response System

If response does not occur as per protocol the CNM/NiC should contact the Registrar or Consultant

CUES FOR CAUTION

- ! Increasing O_2 requirements to maintain SpO_2 levels
- ! Patient located outside of specialist ward
- ! Patient receiving high-risk / unfamiliar therapies
- ! Communication concerns between staff and/or patient
- ! Nurse intuition / 'gut-feeling'

RECOGNISE SEPSIS • ENHANCE SURVIVAL

***THINK SEPSIS**
(Use clinical judgement)

INEWS ≥4 (or ≥5 on Oxygen) and suspicion of infection

Older people or those immunocompromised may present with sepsis with an INEWS <4 (<5 if on Oxygen)

Tús Áite do Shábháilteacht Othar
Patient Safety First

IRISH NATIONAL EARLY WARNING SYSTEM (INEWS) Scoring Key

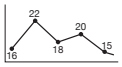
SCORE	3	2	1	0	1	2	3
Respiratory Rate (bpm)	≤ 8		9 - 11	12 - 20		21 - 24	≥ 25
SpO_2 (%)	≤ 91	92 - 93	94 - 95	≥ 96			
Inspired O_2 (F_iO_2)				Air			Any O_2
Heart Rate (BPM)		≤ 40	41 - 50	51 - 90	91 - 110	111 - 130	≥ 131
Systolic BP (mmHg)	≤ 90	91 - 100	101 - 110	111 - 249	≥ 250		
ACVPU/ CNS Response				Alert (A)			New Confusion (C), Voice (V), Pain (P), Unresponsive (U)
Temp (°C)	≤ 35.0		35.1 - 36.0	36.1 - 38.0	38.1 - 39.0	≥ 39.1	

Patient Name:
Date of Birth:
Healthcare Record No:
Addressograph

Year _____ **Ward:** _____ **Consultant:** _____

Date
Time
Healthcare worker (HCW)/Patient(P)/Family(F) concern

AB (Airway & Breathing)



Record as rate, dot and trend line

Respiratory Rate (breaths per minute)
Assess for 60 seconds

3	≥ 25
2	21-24
0	12-20
1	9-11
3	≤ 8

Resp.Score

Peripheral Oxygen Saturation (SpO_2 %)

0	≥ 96
1	94-95
2	92-93
3	≤ 91

SpO_2 Score

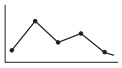
Mode of O_2 delivery
Room air (RA)
Nasal Cannula (NC)
Face mask (FM)
Tracheostomy (T)
HHF/Airvo (H)
CPAP (C) / BiPAP (B)

Room Air or Supplementary O_2

0	Room Air
3	% or L/min
	Device/Mode

F_iO_2 Score

C (Circulation)

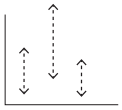

Record as dot and trend line

Heart Rate (beats per minute)
Check pulse manually to ascertain rate, rhythm, quality

3	180
3	170
3	160
3	150
3	140
3	130
2	120
2	110
1	100
1	90
0	80
0	70
0	60
0	50
1	40
2	30

Heart Rate ≤40: immediate medical review

Heart Rate Score


Record as closed arrows connected with dotted line

Blood Pressure (mmHg)
Score applies to Systolic BP

A 20% drop in Systolic Blood Pressure (SBP) for normally hypertensive patients requires a medical review

1	250
0	240
0	230
0	220
0	210
0	200
0	190
0	180
0	170
0	160
0	150
0	140
0	130
0	120
0	110
1	100
2	90
3	80
3	70
3	60
3	50
3	40

Systolic BP ≥200: check BP manually and Doctor to review

Systolic BP Score

D (Disability)

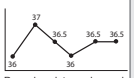
If not Alert, consider GCS. Check blood glucose.

ACVPU
Alert (A), New Confusion/altered mental status/delirium (C) Voice (V), Pain (P), Unresponsive (U)

0	Alert (A)
3	C V P U

ACVPU Score

E (Exposure)



Record as dot, number and trend line

Temperature (°C)

2	39.0
1	38.5
1	38.0
0	37.5
0	37.0
0	36.5
0	36.0
1	35.5
1	35.0
3	34.5

Temp. Score

INEWS Score

Consider Sepsis if INEWS ≥ 4 (or ≥5 on O_2)

Notify Doctor if urine output is < 0.5 mL/kg/hr

Reassess within (Mins./Hrs.)
Blood Glucose
Pain Score
Bowel Movement
Student/HCA Initials
RGN Initials

Modified INEWS Escalation and Response Protocol (to be completed by Consultant or Registrar only)

Not for use within first 24 hours of admission

	Date Year:	Time (use 24hr clock)	Rationale and Instructions/Interventions	Next medical review	Doctor (Signature and MCRN)
Start	20/05	0400	Imp: Chronic COPD, admitted > 24 hours ago Stable with RR 22, SpO_2 92%, O_2 2L/min (INEWS score 7) Escalate if change in RR or increased O_2 requirement to maintain SpO_2 treatment target of 92%*	Maximum 6 hours (10am) or at ward round or sooner if concern	Dr. A Medical Registrar MCRN 1234567
End	20/05	1000			
Start	20/05	1000	Reviewed – continue as above.	24 hours or sooner if concern	Dr. A Medical Registrar MCRN 1234567
End	21/05	1000			
Start	/				
End	/				
Start	/				
End	/				
Start	/				
End	/				

**Text within sections above is provided as example only - please write over the watermark*

Deferred Escalation (to be completed by Registered General Nurse (RGN))

Date/Time (use 24hr clock)	Rationale and Interventions	Review at 30 minutes	Nurse (Signature and NMBI PIN)
25 / 05 / 20 @ 0400	Imp: Decrease in SpO_2 to 94%, on 2L/min O_2 via n/prongs, patient lying flat, patient states they feel okay. Intervention: patient repositioned and n/prongs adjusted. Repeat observation and review decision at 30 minutes. NIC informed.*	0430 hours: SpO_2 back up to 96% on 2L/min O_2. No need for escalation.	Nurse Brown (PIN 12345)
/ / @			
/ / @			
/ / @			

**Text within sections above is provided as example only - please write over the watermark*

ISBAR Communication Tool → **I**dentify **S**ituation **B**ackground **A**ssessment **R**ecommendation

NEUROLOGICAL OBSERVATIONS

GLASGOW COMA SCALE																																	
		Date																															
		Time																															
Eyes closed by swelling = C	**Best Eye Response**																																
	Open spontaneously	4																															
	Open to verbal command	3																															
	Open to pain	2																															
	No eye opening	1																															
Endotracheal = ET Tracheostomy = TT Dysphasia = D	**Best Verbal Response**																																
	Orientated	5																															
	Confused	4																															
	Inappropriate words	3																															
	Incomprehensible sounds	2																															
	No verbal response	1																															
Record the best arm response	**Best Motor Response**																																
	Obeys commands	6																															
	Localising pain	5																															
	Normal flexion to pain	4																															
Paralysed = P	Abnormal flexion to pain	3																															
	Extension to pain	2																															
	No motor response	1																															
		TOTAL GCS																															

Pupil Scale (mm)	1 •	2 ●	3 ●	4 ●	5 ●	6 ●	7 ●	8 ●

Pupils																																	
+ Reacting – No Reaction S = Sluggish C = Closed	**Right**	Size (mm)																															
		Reaction																															
	Left	Size (mm)																															
		Reaction																															

LIMB MOVEMENT																																	
Record each limb if, there are significant differences	**ARMS**	Normal Power																															
		Mild Weakness																															
		Severe Weakness																															
		Spastic Flexion																															
		Extension																															
		No Response																															
R = Right **L** = Left **P**=Paralysed **#**= Fracture	**LEGS**	Normal power																															
		Mild Weakness																															
		Severe Weakness																															
		Spastic Flexion																															
		Extension																															
		No response																															
		Initials																															
		Grade																															
		NMBI Pin																															

Numerical Pain Assessment Scale

0 1 2 3 4 5 6 7 8 9 10

No Pain — Worst Pain Imaginable

Directions: On a scale of 0-10, how would you rate your pain now, if 0 is no pain and 10 is the worst pain imaginable.

Appendix 7: How to complete the INEWS Patient Observation Chart

Deteriorating Patient Improvement Programme

'Healthcare worker or patient or family concern' is new to INEWS V2 and should be recorded with each set of INEWS observations.

HEALTHCARE WORK (HCW) / PATIENT(P) /FAMILY (F) CONCERN *(new addition to INEWS V2)*	
How to assess	**How to record**
If a healthcare worker is concerned about the patient or the patient themselves or the patient's family express concern this should be recorded and escalated appropriately.	Record 'no concern' as '0' Record Healthcare worker concern as 'HCW' Record Patient concern as 'P' Record family concern as 'F'

All 7 INEWS physiological observations are completed and scored to obtain the INEWS score. These are as follows:

1. RESPIRATORY RATE (RR)	
How to assess	**How to record**
Count breaths for one minute.	Enter RR count in the corresponding row. Place a dot in the corresponding row & join the dot to the previous dot using a line to indicate RR trend. Enter the INEWS value (0,1,2 or 3) for RR in the grey row below the RR section.
2. PERIPHERAL OXYGEN SATURATION (SpO_2 %)	
How to assess	**How to record**
Use pulse oximeter to measure oxygen saturation.	Enter % value in the corresponding row. Enter the INEWS value (0,1,2 or 3) for SpO2 in the grey row below SpO2 section.
3. ROOM AIR OR SUPPLEMENTARY OXYGEN (FiO_2)	
How to assess	**How to record**
Is the patient on room air? Or do they need supplementary oxygen?	If on 'room air' record "0" into Room Air Box If on Supplementary O_2 enter either • L/min of O_2 being delivered or • % of O_2 being delivered Record the device in use as per legend e.g. 'RA' for 'Room Air'. Enter the INEWS value (0,1,2 or 3) for FiO_2 in the grey row below FiO_2 section
4. HEART RATE (HR)	
How to assess	**How to record**
Count the patient's pulse for 60 seconds	Record the HR by placing a dot in the corresponding row Join the dot to the previous dot using a line to indicate HR trend Enter the INEWS value (0,1,2 or 3) for HR in the grey row below HR section
5. BLOOD PRESSURE (BP)	
How to assess	**How to record**
Perform blood pressure measurement. Record both systolic and diastolic readings The systolic blood pressure (SBP) provides the INEWS value.	Symbol ⋮ Systolic Reading Diastolic Reading Enter the INEWS value (0,1,2 or 3) for SBP in the grey row below BP section

6. ACVPU *('C' had been added to AVPU to capture 'new confusion/altered mental status/delirium')*	
How to assess	**How to record**
Assess the neurological response using the ACVPU scale; • If fully awake and talking to you the patient is alert (A = Alert). • If the patient is experiencing new confusion, altered mental status or delirium record C (Confusion). • If the patient is not fully awake and responds to voice only record V (Voice) • If the patient does not respond to voice, administer a painful stimulus such as a trapezium squeeze and check for a response (eye opening, verbal such as moaning, or movement); if the patient responds to the painful stimulus record P (Pain). • If the patient is unresponsive record U (Unresponsive).	Record the HR by placing a dot in the corresponding row Join the dot to the previous dot using a line to indicate HR trend Enter the INEWS value (0,1,2 or 3) for HR in the grey row below HR section
7. TEMPERATURE	
How to assess	**How to record**
Perform temperature measurement.	Record the value by placing a dot and exact temperature reading in the corresponding row Join the dot to the previous dot using a line to demonstrate trend. Enter the INEWS value (0,1,2 or 3) for temperature in the grey row below Temperature section.
INEWS Score	
Calculate the patient's INEWS score by adding the INEWS values for each of the seven observations. Follow the INEWS Escalation and Response Protocol for appropriate action. If you are concerned about a patient escalate care even if patient's INEWS score is low or where there is no score.	

Irish National Early Warning System (INEWS) Scoring Key

SCORE	3	2	1	0	1	2	3
Respiratory Rate(bpm)	≤ 8		9 - 11	12 - 20		21 - 24	≥ 25
SpO_2 (%)	≤ 91	92 - 93	94 - 95	≥ 96			
Inspired O_2 ($Fi\,O_2$)				Air			Any O_2
Systolic BP (mmHg)	≤ 90	91 - 100	101 - 110	111 - 249	≥ 250		
Heart Rate (BPM)		≤ 40	41 - 50	51 - 90	91 - 110	111 - 130	≥ 131
ACVPU/CNS Response				Alert (A)			New confusion (C), Voice (V), Pain (P), Unresponsive (U)
Temp (°C)	≤ 35.0		35.1 - 36.0	36.1 - 38.0	38.1 -39.0	≥ 39.1	

Appendix 8: Literature search strategy

'Methods' section below is taken directly from the HRB-CICER (August 2019) systematic review of the literature to underpin the NEWS NCG No. 1 guideline revision process. The full systematic literature review and references can be seen in Annex 1.

Methods

This systematic review update presents the available evidence to estimate the clinical effectiveness and cost-effectiveness of the INEWS 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).

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 0.6.

Table 0.1: Specific PICOS for review question 1

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?	
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

Key: NEWS: National Early Warning System, MEWS: Modified Early Warning System, RRS: Rapid Response Systems, MET: Medical Emergency Team.

Table 0.2: Specific PICOS for review question 2

Q2: How effective are the different EWSs in terms of improving key patient outcomes in adult (non-pregnant) patients in acute health care settings?	
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

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?	
Population	Stakeholders including HCPs and their managers
Intervention	Education programmes including but not limited to: ALERT™ COMPASS©
Comparison	Usual care, other education programme
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

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?	
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

Key: QALYs: Quality-adjusted life years, HYE: Health Year Equivalent, DALYs: Disability Adjusted Life Years, LYG: Life Years Gained, ICERs: Incremental cost-effectiveness ratio, ICU: Intensive Care Unit, HDU: High Dependency Unit, RRT: Rapid Response System, MET: Medical Emergency Team.

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 others[13, 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

Key: COPD: Chronic Obstructive Pulmonary Disorder, CREWS: Chronic Respiratory Early Warning System, NEWS: National Early Warning System, LOS: Length of stay, ICU: Intensive Care Unit, HDU: High Dependency Unit.

Table 0.6: Specific PICOS for review question 6

Q6: Why do HCPs fail to escalate as per the INEWS 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 INEWS 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 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
- SocINDEX
- Exerptamedica 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/, 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:

- Open Grey (http://www.opengrey.eu/)
- New York Academy of Medicine (https://nyam.org/)
- National Institutes of Health (NIH) (https://www.nih.gov/)
- Health Service Executive (HSE) (https://www.hse.ie/eng/)
- Health Information and Quality Authority (HIQA) (https://www.hiqa.ie/)
- Health Research Board (HRB) Ireland (http://www.hrb.ie/home/)
- Lenus (http://www.lenus.ie/hse/)
- World Health Organization (WHO) (http://www.who.int/en/)
- National Institute for Health and Care Excellence (NICE) (https://www.nice.org.uk/)
- Centre for Health Economics and Policy Analysis (CHEPA) (http://www.chepa.org/)
- Institute of Health Economics (Alberta Canada) (https://www.ihe.ca/)
- Department of Health UK (https://www.gov.uk/government/organisations/department-of-health-and-social-care)
- National Health Service UK (NHS) (https://www.england.nhs.uk/)
- Public Health Agency of Canada (https://www.canada.ca/en/public-health.html)
- Google Scholar and Google (https://scholar.google.com/, https://www.google.ie)
- 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/).

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

Inclusion criteria	Question 1 (EWS)	Question 2 (Outcomes)	Question 3 (Education)	Question 4 (Economics)	Question 5 (Sub-populations)	Question 6 (Qualitative)
Adult acute setting patients (16 years or older) (Excluding paediatric, obstetric, ED patients and DNR patients)	X	X	X	X	X	X
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	X	X		X	X	X
Investigated the effectiveness of education programmes used to train registered HCPs in relation to EWSs and or track & trigger systems (Excluding EWS not suitable for bedside monitoring)			X			
Acute setting in countries categorised as either very high or high HDI(19)	X	X	X	X	X	X
Data were pre- and post-critical adverse clinical event(s) or pre-post EWS intervention or pre-post education intervention	X	X	X	X	X	X
Comparison of modified EWSs (e.g. CREWS) to the NEWS only in specific sub-populations (frail older adults, patients with severe respiratory conditions)					X	
Qualitative study design						X
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)	X	X	X	X	X	
Grey literature	X	X	X	X	X	X
English language	X	X	X	X	X	X
*Published since November 2015 (Update)	X	X	X	X		
**Published since January 2011 (New review questions)					X	X

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

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

Key: RCT: Randomised Controlled Trial, NRCT: Non-Randomised Controlled Trial, CBA: Controlled Before-After study, ITS: Interrupted Time Series study, EPOC: Effective Practice and Organisation of Care, AGREE: Appraisal Of Guidelines For Research & Evaluation, CHEC-list: The Consensus Health Economic Criteria LIST, ISPOR: International Society for Pharmacoeconomics and Outcomes Research, QUADAS: Quality Assessment of Diagnostic Accuracy Studies, CASP: Critical Appraisal Skills Programme.

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.[36]

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.[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. 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:

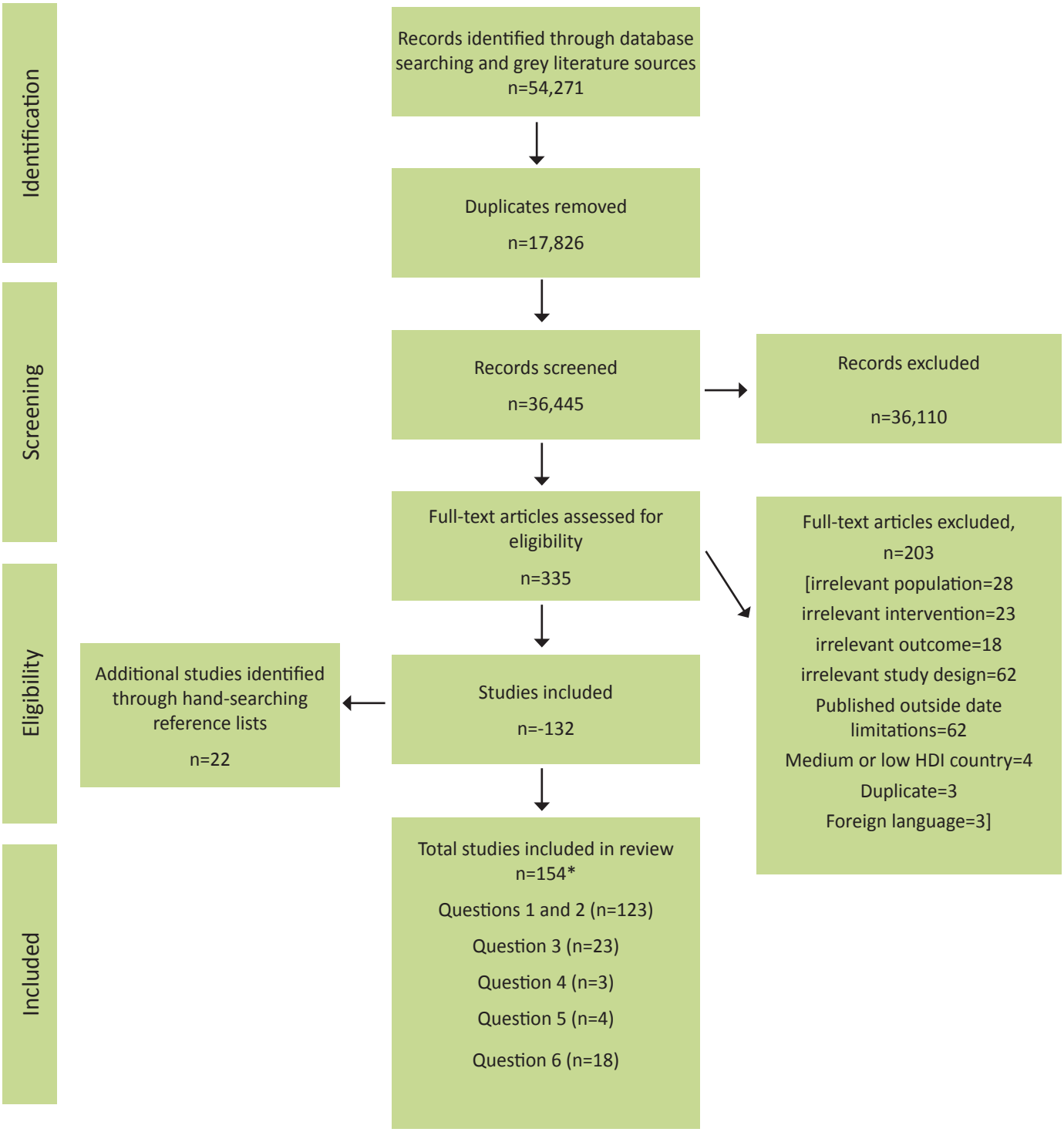
- N=123 studies for questions 1 and 2 (a description of EWSs and their effectiveness on patient outcomes)
- N=23 studies for question 3 (the effectiveness of different EWS-based educational interventions)
- N=3 studies for question 4 (an economic evaluation of the cost-effectiveness of EWSs)
- N=4 study 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



Appendix 9: Evidence table (sample)

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

Author, Country	No of parameters, Name of EWS	Parameters included in EWS								Paper-based or digital	Recording of parameters	Aggregate EWS, score
		RR	Sp O_2	Fi O_2	SBP	HR	AVPU	Temp	Other - specify			
[110]Abbott (2016), UK	10-item NEWS	X	X	X	X	X	X	X	Lactate, glucose, base excess	Paper-based	Not reported	Yes (0-3)
[117]Albert (2011), USA	12-item MEWS	X	X	X	X	X		X	Urine output, level of consciousness, WBC, difficulty breathing, new focal weakness, staff or family concern.	Digital	Not reported	Yes (0-3)
[71]Al-Qahtani (2013), Saudi Arabia	Single items, not combined	X	X		X	X			Urine output, level of consciousness using GCS, staff concern about the patient	Digital	4-hourly	No
[118]Bailey (2013), USA	7-item EWS with real-time automated alerts generated 24/7.	X	X		X	X			Shock index, anticoagulation use, DBP	Digital (algo-rithm based)	Not reported	No
[119]Beitler (2011), USA	Single items, not combined	X	X		X	X			Clinical judgement/concern	Not reported	Not reported	No
[57]Bunken-borg (2014), Denmark	6-item MEWS	X	X		X	X	X	X		Paper-based	8-hourly	Yes (0-3)
[120]Capan (2015), USA	7-item NEWS	X	X	X	X	X	X	X		Digital (algo-rithm based)	Not reported	Yes (0-3)
[121]Churpek (2013a), USA	8-item EWS	X	X	X	X	X	X	X	DBP	Digital (algo-rithm based)	Not reported	No
[122]Churpek (2012), USA	5-item MEWS	X			X	X	X	X		Digital	8-hourly	Yes (0-3)
[123]Churpek (2015), USA	8-item MEWS	X	X		X	X		X	DBP, pulse pressure index (=SBP-DBP/SBP), shock index(=SBP/HR)	Digital	4-hourly	Yes (0-3
[124]Davis (2015), USA	Single items, no specific EWS – criteria for activating RRT.	X	X		X	X	X	X	Chest pain, acute blood loss, Arterial Blood Gas test obtained, PetCO2 rise; laboured breathing, persistent apneas, staff concern, family concern.	Not reported.	Not reported.	No

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 INEWS 2020 guideline due to document size. All evidence tables available on request.

Appendix 10: Economic assessment

The following excerpt has been taken directly from the HRB-CICER (August 2019) systematic review of the literature which underpinned the NEWS (2013) NCG revision. The full systematic literature review is available as Annex 1.

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 transferability 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 (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

Study author (year), country	Intervention	Design (no. of studies)	Condition(s) or population targeted	Type of economic evaluation	Clinical Outcomes
[3] HIQA (2015), Ireland	Digital NEWS	Systematic review with BIA (n=3)	Acute setting, adult in-patient services excluding maternity and paediatrics	HTA including a BIA using data from a UK study to estimate costs.	Hospital LOS
[4] NCEC (2013), Ireland	NEWS	Systematic review with BIA (n=2)	Adult acute medical patient	BIA	Reduction in ICU bed days
[5] Simmes (2014), The Netherlands	Implementation of a RRS	Before-after study	Surgical patients >3 days post major surgery	Costing study	ICU LOS

Key: HIQA: Health Information and Quality Authority; NCEC: National Clinical Effectiveness Committee; NEWS: National Early Warning Score; NCG: National Clinical Guideline; RRS: Rapid Response System; BIA: Budget Impact Analysis; AMU: Acute Medical Unit; HTA: Health Technology Assessment; ICU: Intensive Care Unit; LOS: Length of stay.

Results

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 a 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 an 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 setting 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 a 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, clinical leadership and project management). 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 in the full economic assessment - Annex 1).

NCEC 2013 INEWS 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™ 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© 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 in the full economic assessment - Annex 1).

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 in the full economic assessment – Annex 1).

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 generalisabilty 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 in the full economic assessment - Annex 1).

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 in the full economic assessment - Annex 1).

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.

Appendix 11: Consultation report

Recipient	Circulated to:
Patients groups	June Boulger, HSE Lead, National Patient Experience Programme and Clare Duffy, Family Carers Ireland
External review	Professor Peter Watkinson Dr Mandy Odell Professor Imogen Mitchell
Clinical Programmes and healthcare divisions	ONMSD via Dr Geraldine Shaw, D/ONMSD Directors of Nursing Acute Hospitals, NMPDUs, CNMEs via ONMSD Office of Chief Clinical Officer, HSE NCPs (Clinical leads, Nurse Leads): • Surgery • NAMP • Emergency Medicine • Sepsis • Paediatrics • Critical Care • Anaesthesia National Director and Deputy Director Acute Operations HSE CEOs/GMs and Clinical Directors Acute hospitals NCAGLs NCPs
Professional groups	Nursing and Midwifery Board of Ireland (NMBI) INMO CORU and HSCP groups IARO RANPs HEIs ICGP IHCA
Other	NOCA SIPTU National Ambulance Service

Feedback was received from the following:

Dr Kevin Clarkson Critical Care, University Hospital Galway	Joe Fahy RTO, Portiuncula University Hospital
Dr Siobhan Ni Bhriain NCAGL Mental Health	Caroline Costello IP&C, Mayo Mental Health Service
Samantha Hughes QAV, HSE	Ronan O'Cathasaigh DPIP, HSE
Breda Ward and Claire Conway Regional RTO and Surgical DNM, Mullingar	Ann Calvert ED, Regional Hospital Tullamore
Gareth Clifford AHD, HSE	Dr Michael Power Critical Care, Clinical Lead CCP, Beaumont Hospital
Paula Vernon and Mark McCullagh State Claims Agency	Dr Diarmuid Quinlan GP, Glanmire Cork
Dr Rachel Crowley St. Vincent's University Hospital	Helen Flaherty and Mary Ring Sepsis Co-ordinator and Nurse Tutor, University Hospital Kerry
Dr Brian McNicholl (via Sinead O'Reilly, EMP) ED Consultant Galway University Hospital	Dr Owen O'Sullivan Mercy University Hospital Cork
Prof. Sean Tierney/Ms. Ger Conway RCSI Surgical Affairs	Dr Mark Rogan Respiratory Physician, University Hospital Waterford
Dr Tony Cox Irish College of General Practitioners	Dr Maria Neary et al School of Nursing and Midwifery, RCSI
Eilis Croke NQAIS Clinical HSE	Anne McNulty/Marie O'Hora Resuscitation Dept, University Hospital Limerick
Judy McFeely On behalf of St. Michael's Hospital, Dun Laoighre	Anna Butler South Tipperary General Hospital
Anne Powell and Michelle Stout CPCs, Cork University Hospital	Dr Vida Hamilton National Clinical Advisors Group Lead (NCAGL), Acute Operations
Geraldine Kennedy University of Limerick Hospital Group	Sandra O'Donovan ADON, Cappagh National Orthopaedic Hospital
Dr Michelle Duggan Consultant Anaesthetist, Mayo University Hospital	Laurence Rousseill Clinical Risk Manager, National Maternity Hospital, Holles Street
Heather Helen Midwifery Clinical Skills Co-ordinator, University Hospital Galway	Val O'Brien Nurse Practice Development Co-ordinator, St. James's University Hospital
Dr Julie McCarthy Clinical Director SSWHG on behalf of Nursing, the Deteriorating Patient and Outreach Service, Deteriorating Patient Governance Committee, Cork University Hospital	Claire Costigan RANP Deteriorating Patient, Cork University Hospital

Margaret Tuohy EWS, Co-ordinator Naas General Hospital	Marion Ryder Sligo University Hospital
Grainne Rohan Practice Dev. Team, University Hospital Kerry	Sue Markey/ Kay Connolly St Vincent's University Hospital
Elaine Hanly CNME Team, Mater Misericordiae University Hospital	Orla Wright St. Columcille's Hospital
Una O'Brien, Dr. Ger Markey ED Cons, Mary Ivory RO, Cliona Rafter NPDU, Curtis Hartwell NPDU, University Hospital Waterford	Fiona Willis NMPDU, Cork/Kerry
Prof. Martin Cormican AMRIC Division, HPSC	Ursula Morgan Roscommon University Hospital
Fiona McDaid Emergency Medicine Programme	Cicily Regi On behalf of Tallaght University Hospital
Eilis Redmond Wexford General Hospital	Dr Paul McElwaine Tallaght University Hospital
Lia Evans QAV NEWS Audit Team, HSE	Caroline Costigan, Mary McHale, Sheila Hayes Mayo Mental Health Services
Sheila Cahalane NMPDU, DSKW	Eithna Coen NMPDU, SE
Clare MacGabhann and team National Medicinal Product Prescribing	

All feedback received was collated using an excel spreadsheet and worked through methodically, informed by a thematic analysis approach, by the DPIP team and the GDG. Changes were made as deemed appropriate. A rationale was provided where a change was not made in response to a piece of feedback. Collated feedback can be obtained from the DPIP team on request at dpip.1@hse.ie

Appendix 12: Monitoring and Audit

Sample Audit Tools

Data collection tool: Utilisation and accuracy of completion of the INEWS Patient Observation Chart

Deteriorating Patient Improvement Programme

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

Review INEWS observation chart for previous 48 hours

INEWS Patient Observation Chart Completion Audit

Ward /Area		**Date of Audit**	
Auditor(s)			

		Answer Yes, No, N/A to the following questions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1.Documentation	1	Patient Name is recorded?										
	2	Date of Birth Recorded?										
	3	Healthcare Record Number is recorded?										
	4	INEWS observations completed 6 hourly for first 24 hours following admission? (if admitted during audit timeframe)										
	5	INEWS observations are assessed at least 12 hourly in past 48 hours?										
	6	Frequency of monitoring increased as patient's clinical condition required?										
	7	'Review within (mins/hrs)' section completed?										
	8	INEWS observation set is dated for every entry?										
	9	INEWS observation set is timed using the 24-hour clock for every entry?										
2. Parameters	10	Healthcare Worker / Patient / Family Concern recorded?										
	11	Respiratory rate - recorded every time?										
	12	Oxygen Saturation - recorded every time?										
	13	FiO_2 - recorded every time?										
	14	Heart Rate -recorded every time?										
	15	Blood Pressure - recorded every time?										
	16	ACVPU Response - recorded every time?										
	17	Temperature - recorded every time?										
3. Score	18	INEWS score is totalled for each set of observations?										
	19	INEWS Score is calculated ***accurately*** every time?										
	20	INEWS Score is initialled every time?										

Comment:	
Action:	
1.Documentation	
2.Parameters	
3. Score	

Contact DPIP (DPIP.1@hse.ie) for formatted Excel Sheet & operational definitions.

Data collection tool: INEWS Escalation & Response Protocol Audit Tool

Deteriorating Patient Improvement Programme

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

Perform this audit on healthcare records of patients who

- trigger an INEWS score of 3 or more.
- transferred to higher level of care.
- Had an unanticipated cardiopulmonary arrest and/or unplanned admission/readmission to ICU
- Were escalated to urgent or emergency team care.

INEWS Escalation & Response Protocol Audit

Ward /Area		**Date of Audit**	
Auditor(s)			

	Answer Yes, No, N/A to the following questions	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	For the last recorded INEWS score was the Escalation & Response Protocol adhered to in relation to frequency of observations monitoring?										
2	For the last recorded INEWS score was the Escalation & Response Protocol adhered to in relation to minimum alert?										
3	Were the patient's INEWS Score or parameters adjusted?										
4	Was the nurse in charge informed of INEWS Score?										
5	Was there an appropriate increase in the frequency of observations monitoring?										
6	Was the patient reviewed in a timely manner by the medical team (as per INEWS Escalation and Response Protocol)										
7	Was there documented evidence of medical response to requested action or review?										
8	Did the doctor formulate and document a post review plan of care?										
9	Was there documented evidence that a senior doctor was consulted when care was escalated?										
10	Was there documented evidence that the SHO consulted with a Registrar if no response to treatment?										
11	Was there documented evidence that a Registrar or Consultant reviewed the patient with an INEWS score ≥ 7?										
12	Was the response team activated?										
13	Was the patient transferred to a higher level of care where appropriate?										

Comment:

Action:

Contact DPIP (DPIP.1@hse.ie) for formatted Excel Sheet & operational definitions.

Monitoring Compliance with Audit

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.

The National Quality Improvement Team's 'QI Method Toolkit' is available as a resource to support staff working on QI projects or initiatives at the following link:

https://www.hse.ie/eng/about/who/qid/nationalsafetyprogrammes/national-quality-improvement-toolkit.html

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 8 "yes" and 2 "no" answers, the score is calculated as follows: 8 (yes answers) divided by 10 (total of yes and no answers) multiplied by 100. The score in this example would be 80%.

Suggested sample size and frequency of audit of INEWS observation charts

- A random sample of 25% of the patient complement in the ward/unit with a recommended minimum of five collections and to a maximum of ten collections -where the sample of 25% exceeds 10 charts. Where bed occupancy is less than five patients the full patient complement is taken as the sample size. Audits should be undertaken monthly.

Suggested sample size and frequency of audit of INEWS Escalation and Response Protocol

- The recommended sample size for this audit is a minimum of five charts per quarter (four times per year) or 10 charts twice a year.

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:

Identification

Identity of individual communicating deterioration	Yes	No
Identity of patient	Yes	No

Situation

Identity of individual(s) receiving communication	Yes	No
Identity of patient	Yes	No
Was the reason for calling identified	Yes	No
Were concerns identified	Yes	No

Background

Was the relevant background documented?	Yes	No

Assessment

Was there evidence of patient assessment?	Yes	No

Patient Outcome

☐ Stabilised
☐ Transferred HDU/ICU
☐ Transferred to other facility
☐ Death

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

Observational studies may also be carried out to audit communication in relation to patient deterioration.

Appendix 13: National INEWS key performance indicators (KPI)

	NEWS* KPI
Q1	Is there a local National Early Warning Systems (NEWS)/EWS Governance Group in Place and meetings held on quarterly basis?
Q2	Have a minimum of 50% (target 85% total nursing staff) completed NEWS education?
Q3	Have a minimum of 50% (target 85% total medical staff) completed NEWS education?
Q4	Has there been an audit of the hospital's recognition and response practices against key NEWS recommendations (audit of minimum 10 records annually)?
Q5	Are plans underway to ensure that total number of cardiorespiratory arrests, unplanned admissions to ICU and readmissions to ICU (clinical outcomes) are being recorded at local level?
Q6	Is there evidence that audit and clinical outcome data is reviewed and actioned by Hospital CEO/General Manager/Clinical Director?
Q7	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?

**Note: The above national KPI has been in place since 2019. The title of the KPI will be updated to INEWS when the KPI is updated by BIU for the HSE National Service Plan 2021.*

Appendix 14: Guidance for designated INEWS Consultant Lead and INEWS Co-ordination

INEWS Hospital Consultant Lead

Clinical deterioration occurs in patients of all specialties and thus requires senior clinical leadership at hospital level to ensure closed loop governance of deteriorating patient outcomes. The critical knowledge of clinicians offers those responsible for assuring healthcare quality and safety at a system level an important insight into the frontline reality, challenges and opportunities of clinical care.

The INEWS Consultant lead will provide clinical leadership for INEWS at hospital level and advice to the hospital and hospital group on matters impacting quality and safety in the area of early warning systems. The INEWS Consultant Lead may chair the EWS Governance Committee.

The Consultant Lead for INEWS will be someone who communicates a vision for high quality healthcare that generates enthusiasm and commitment among their colleagues. They will draw on their experience and knowledge to build buy-in and support from key stakeholders. Their vision for excellence in the management of the deteriorating patient will include excellence at the clinician-consumer interface through to excellence at the whole system level. They will be passionate about improving outcomes of care and consumer experiences of care.

The INEWS Consultant lead will also have a role in bringing the INEWS users' voice (doctors, nurses, health and social care professionals) to the attention of executive management teams in order to influence and develop ideas directly from the clinical, consumer-facing workforce to system leaders. Consultation and engagement with clinicians and people with lived experience from across the sector identified six key areas of priority for INEWS improvement work:

- Clinical leadership
- Patient experience and escalation
- Urgent and emergency response service – e.g. ANP service
- Use of clinical outcome measures to drive improvement
- A move towards digital INEWS
- Create synergies between all relevant systems e.g. INEWS, IMEWS, PEWS, sepsis etc.

These key priorities will represent the initial strategic focus of the INEWS Consultant Lead working through the EWS Governance group. Other areas may include:

- The provision of leadership to the EWS Governance Group
- Respond to and escalate data and information that indicates a safety and quality issue related to care of the deteriorating patient in their hospital
- Identify improvement projects related to INEWS in the hospital and work collaboratively to ensure linkages and synergies with others to achieve project goals
- Ensure integration with local quality improvement processes for example, Lean Management, SixSigma, Model for Improvement
- Avail of national QITeam and DPIP supports if required
- Advocate and influence for the progression to a digital INEWS and a hospital-wide urgent and emergency response system e.g. ANP service

To make this role achievable the INEWS Consultant Lead will require, depending on the hospital model, one session per week.

INEWS Consultant lead and key stakeholders

INEWS Co-ordination

Evidence identifies the importance of, and the desire by staff, to have a co-ordinated approach to the sustainable improvement of patient outcomes relating to clinical deterioration. There are a number of roles (e.g. Sepsis ADONs) and forums (e.g. Resuscitation Committees) across hospitals and hospital groups with responsibility for various elements of the acutely unwell patient pathway. INEWS V2 recommends synergy across these groups with a focus on using patient outcome data to drive improvement and patient safety work. INEWS implementation would benefit from having a designated co-ordinator. The importance of a system-wide co-ordinated approach has been recognised at national level where DPIP, QAV, Patient Safety Programme, National QI Team and Acute Operations Business Intelligence Unit are working collaboratively to drive improvements related to the deteriorating patient.

INEWS co-ordination at hospital level will entail:

- The alignment of the governance of related systems, for example, INEWS, IMEWS, PEWS, sepsis, Morbidity & Mortality, resuscitation etc
- Streamlining of data collection processes across all related systems
- Collation, synthesis, presentation and escalation of deteriorating patient data
- Interpretation and presentation of findings, in collaboration with INEWS Consultant Lead, to Hospital Clinical Governance Committee
- Collaboratively determining key improvement projects related to INEWS in the hospital and work collaboratively to ensure linkages and synergies with others to achieve project goals
- Ensure integration with local quality improvement processes for example, Lean Management, SixSigma, Model for Improvement
- Report on the progress of improvement projects to the Hospital Clinical Governance Committee
- Support frontline staff to implement and use INEWS through ongoing education updates, audit activities and feedback and review processes
- Support the development of urgent and emergency response teams as they evolve
- Link with national DPIP team to avail of emerging evidence and evolving practices nationally and internationally

Appendix 15: Resources

Annex 1: HRB-CICER Systematic Review of the Literature
https://www.gov.ie/en/collection/c9fa9a-national-clinical-guidelines/

Annex 2: Budget Impact Analysis
https://www.gov.ie/en/collection/c9fa9a-national-clinical-guidelines/

HSELand
https://www.hseland.ie/

National Acute Medicine Programme:
https://www.hse.ie/eng/about/who/cspd/ncps/acute-medicine/national-early-warning-score/

National Clinical Programmes:
https://www.rcpi.ie/national-clinical-programmes/

NCG No. 4 IMEWS:
https://www.hse.ie/eng/about/who/cspd/ncps/obstetrics-gynaecology/resources/imews/

NCG No. 5 Communication (Clinical Handover) in Maternity Services:
https://www.gov.ie/en/collection/d3b3bd-clinical-handover-in-maternity-services/

NCG No. 6 Sepsis:
https://www.gov.ie/en/collection/dd8fbf-sepsis-management/

NCG No. 11 Clinical Handover in Acute and Children's Hospital Services:
https://www.gov.ie/en/collection/006e63-clinical-handover-in-acute-and-childrens-hospital-services/

NCG No. 12 PEWS:
https://www.rcpi.ie/paediatric-early-warning-system/

NCG No. 18 EMEWS:
https://assets.gov.ie/35813/bc67aa6f072140f59b6125e7a24dd923.%2018%20Full%20Report

ONMSD:
https://healthservice.hse.ie/about-us/onmsd/

QI Toolkit:
https://www.hse.ie/eng/about/who/qid/nationalsafetyprogrammes/national-quality-improvement-toolkit.html

References

Beitler, J.R., Link, N., Bails, D.B., Hurdle, K. and Chong, D.H. (2011) Reduction in hospital-wide mortality after implementation of a rapid response team: a long-term cohort study. Critical Care, Vol. 15 (R269) available at: http://ccforum.com/content/15/6/R269

Brady, P.W., Muething, S. Kotagal, U. et al (2013) Improving Situation Awareness to Reduce Unrecognised Clinical Deterioration and Serious Safety Events. *Pediatrics* Vol. ***131*** (1) (January 2013), pp e299 – e308

Bunkenborg, G., Samuelson, K., Poulsen, I., Ladelund, S. and Akeson, J. (2014) Lower incidence of unexpected in-hospital death after interprofessional implementation of a bedside track-and-trigger system. *Resuscitation*, Vol. ***85*** (2014), pp 424-430

Clyne B, O'Neill M, Jordan K, O' Neill S, Carty P, Tyner B, Smith SM, Ryan M. (2018) *Clinical and cost effectiveness of maternity early warning systems: systematic review update* Dublin, HRB-CICER, HIQA.

De Meester, K., Das, T., Hellemans, K. et al. (2013) Impact of a standardised nurse observation protocol including MEWS after Intensive Care Unit discharge. *Resuscitation*, Vol. ***84*** (2013), pp 184-188

Earls, S., Donohue, C. & Salter, N. (2019) *Effectiveness of in-hospital resuscitation: establishing a baseline.* Poster presentation: Irish Association of Emergency Medicine Conference, 7th/8th November 2019, Sligo

Goncales, P.D.S., Polessi, J.A., Bass, L.M. et al. (2012) Reduced frequency of cardiopulmonary arrests by rapid response teams. *einstein*, 2012; Vol. ***10*** (4), pp 442-448

Health Innovation Hub Ireland (2019) Comparison of digital NEWS with paper-based NEWS. National Oversight Group for Health Innovation Hub Ireland, Dublin

Health Information and Quality Authority (2015) *Health technology assessment of the use of information technology for early warning and clinical handover systems*, Dublin, HIQA

HRB-CICER (2019) *Clinical and Cost-Effectiveness of the National Early Warning System (NEWS): a Systematic Review Update*, Dublin, Health Research Board – Collaboration in Ireland for Clinical Effectiveness Reviews, HIQA.

Jarvis, S., Kovacs, C., Briggs, J. et al. (2015) Aggregate National Early Warning Score values are more important than high scores for a single vital signs parameter for discriminating the risk of adverse outcomes. *Resuscitation*, Vol. ***87*** (2015), pp 75 - 80

Ludikhuize, J., Borgert, M., Binnekade, J. et al (2014) Standardised measurement of the Modified Early Warning Score results in enhanced implementation of a Rapid Response System: A quasi-experimental study. *Resuscitation*, Vol. ***85*** (2014), pp 676-682

McCaughan, C. (2016) *Learning from serious incident investigations to improve safety and to reduce injury: A systematic evaluation of the quality of the reports of serious incident investigations completed in 2014 with analysis of the causal factors. Summary Report.* Quality Assurance and Verification Division, HSE

Mullen, L. (2013) *A Review of Serious Incident Investigation Reports from the years 2009-2012: Identifying patient safety issues that emerge from an overview analysis of national data*, QPSD, HSE

Petersen, J.A., Antonsen, K. and Rasmussen, L.S. (2016) Frequency of early warning score assessment and clinical deterioration in hospitalised patients: A randomised trial. *Resuscitation*, Vol. ***101*** (2016), pp 91-96

Prytherch, D.R., Smith, G.B. Schmidt, P.E. and Featherstone, P.I. (2010) ViEWS – Towards a national early warning score for detecting adult inpatient deterioration. *Resuscitation*, 81 (2010), pp 932-937

Quality Assurance and Verification (2017/2018) Healthcare Audit Summary Report: Audit of compliance of selected recommendations from the National Early Warning Score (NEWS) 2013, *Quality Assurance and Verification Division, HSE*, QAV005/2017

Royal College of Physicians London (2017) *National Early Warning Score (NEWS) 2: Standardising the assessment of acute illness severity in the NHS.* Updated report of a working party. London: RCP, 2017

Salter, N. (2019) Personal communication

Sebat, F., Vandegrift, M.A., Childers, S. and Lighthall, G.K. (2018) A Novel Bedside-Focused Ward Surveillance and Response System. *The Joint Commission Journal on Quality and Patient Safety*, Vol. ***44***, pp 94-100

Simmes, F., Schoonhoven, L., Mintjes, J. et al. (2013) Effects of a rapid response system on quality of life: a prospective cohort study in surgical patients before and after implementing a rapid response system. *Health and Quality of Life Outcomes*, Vol. ***11*** (74), available at: http://www.hqlo.com/content/11/1/74

Smith, T., Den Hartog, D., Moerman, T. et al. (2012) Accuracy of an expanded early warning score for patients in general and trauma surgery wards. *British Journal of Surgery*, Vol. ***99***, pp 192-197

Smith, G.B., Recio-Saucedo, A. and Griffiths, P. (2017) The measurement frequency and completeness of vital signs in general hospital wards: An evidence free zone? *International Journal of Nursing Studies*, Vol. ***74*** (2017), pp A1-A4

An Roinn Sláinte
Department of Health

Department of Health, Block 1, Miesian Plaza, 50-58 Lower Baggot Street,
Dublin 2, D02 VW90, Ireland

Tel: +353 1 6354000 • Fax: +353 1 6354001 • www.health.gov.ie