Royal College of Physicians

Setting higher standards

National Early Warning Score (NEWS)

Standardising the assessment of acute-illness severity in the NHS

Report of a working party July 2012

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*__Conflict of interest__: Professors Smith's wife is a minority shareholder in The Learning Clinic. The Learning Clinic and Portsmouth Hospitals NHS Trust co-developed the electronic vital signs gathering system (VitalPAC) used to collect a large vital signs database against which the performance of NEWS was tested. Portsmouth Hospitals NHS Trust has a royalty agreement with The Learning Clinic. This potential conflict was considered by the NEWSDIG and it was decided that it did not preclude participation in the working party. Professor Smith provided access to the extensive patient database which had been used to develop and validate ViEWS (VitalPAC), and this proved to be invaluable in the development and analysis of the performance of the NEWS. Professor Smith was an employee of Portsmouth Hospitals NHS Trust until 31 March 2011.

No other conflicts of interest were declared.

Acknowledgements

The NEWS charts and educational programme

A small subgroup of the working party, led by Professor Derek Bell and supported by NHS Training for Innovation, created the design and layout of the final NEWS charts and worked with OCB Media, who were commissioned to develop the NEWS e-learning programme. This educational programme will support the dissemination and learning for all staff in the use of the NEWS charts and scoring system.

The NEWS educational programme was funded by the Royal College of Physicians, the Royal College of Nursing, the National Outreach Forum and NHS Training for Innovation.

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Foreword

Working in partnership with patients and many professional groups, the Royal College of Physicians (RCP) has led the development of this new National Early Warning Score – another key milestone in the RCP's drive to improve the care of the acutely ill patient, a journey that began over a decade ago. Since then care for acutely ill patients has been revolutionised in the light of RCP recommendations, as hospitals have introduced dedicated acute medical units (AMUs) and appointed consultants in the new and growing specialty of acute medicine. With this bedrock to build on, we have moved forward with specific initiatives to reduce variation in the quality of care, not just in the AMU, but across the whole hospital, including the production of a series of toolkits focusing on acute care.

Having identified that the multiplicity of early warning systems used in different hospitals in the UK is causing a lack of consistency in detecting deterioration of patients' conditions and calling for urgent medical help, I am grateful to Professor Bryan Williams and all the working party for designing this clear national standard to drive the 'step change' required in the assessment and response to acute illness.

However well-constructed and accepted, a national standard cannot change practice unless it is adopted by every hospital, and underpinned by education and training. The RCP is supporting such implementation by making the report and the associated charts free to use across the NHS, and has co-developed an online training programme with the Royal College of Nursing and the National Outreach Forum. We hope to see the score adopted as soon as possible right across the NHS.

Sir Richard Thompson
President, Royal College of Physicians

Introduction on behalf of the National Outreach Forum and the Royal College of Nursing

Critical care outreach and acute care teams have long encouraged the use of early warning scoring systems to enable a more timely response to, and assessment of, acutely ill patients. Indeed, optimising organisational delivery of safe, equitable and quality care for all acutely unwell, critically ill and recovering patients, irrespective of location or pathway, has been a life's work for many clinical champions of 'outreach', including a significant portion of ours.

When we were asked in 2009 to join NEWSDIG, we initially wondered if we would ever reach consensus on a single standardised national early warning scoring system. But after much work, debate and consultation with clinical colleagues with a wealth of expertise in this area, we believe that this first iteration of 'NEWS' and the accompanying web-based learning package provide a key step forward. It is a step towards standardisation of assessment, monitoring and tracking of acutely and critically ill patients, and importantly, it enforces the necessity of early clinical review and the competency requirements and availability of the clinical team undertaking the review.

With reference to the latter, the process of developing the NEWS and an appropriate clinical response has further galvanised the often overlooked contribution of skilled critical care outreach and acute care teams. This document therefore serves as a reminder that the availability of these teams 24/7 should be integral to organisational patient-safety strategies.

The next steps are to embrace and encourage the widespread use of NEWS with a view to generating a robust evidence base which can be used to evaluate effectiveness and drive future refinement if required.

Finally, we would like to acknowledge and thank clinical colleagues and peers who have engaged with this project with enthusiasm and commitment. We are indebted to their clinical wisdom and insight into the topic, and in particular the time they have taken to offer constructive feedback and comment – thank you.

Lesley Durham RGN MA
National Outreach Forum

NOrF
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Preface

In 2005, I was asked by Dame Carol Black, then president of the RCP, to chair the RCP's Acute Medicine Task Force which culminated in its report in 2007, *Acute medical care: the right person, in the right setting – first time.* This report produced a template for the organisation of acute medical care in our hospitals and contained a number of recommendations which have been implemented nationally. Following its publication, the next RCP president Sir Ian Gilmore asked me to pinpoint the single-most important recommendation in the report that should be taken forward by the RCP. The decision was easy – we needed a National Early Warning Score (NEWS). We could have selected easier options but we saw this as having enormous potential to improve patient care. Colleagues over the years in various specialties have done a tremendous amount of good work, developing several early warning systems of which they were justifiably proud and to which, in some cases, firmly wedded. Perhaps because this was not the area of my life's work, I saw things a little differently. This was not just about 'what is the best system?', it was also about recognising the huge advantages of 'everybody using the same system'. It was not about the development of a completely novel approach – there was no need for that, as many of the elements of a simple and effective early warning score were already in place. The step change was the need to standardise the approach across the NHS and link the scoring system to clearly defined principles with regard to the urgency of response, the competency of the responders and the organisational infrastructure required to deliver an effective clinical response to acute illness, every time it is needed. Just like the highly effective 'simple surgical checklist', simple things done well can make a huge impact in healthcare and the NEWS has the potential to do the same.

It has been an honour and indeed a challenge to chair the National Early Warning Score Development and Implementation Group (NEWSDIG) on behalf of the RCP. The enthusiasm and commitment to this project within the group has been inspiring. It hasn't all been plain sailing and I am particularly indebted to Professor Derek Bell who has an extraordinary grasp of the topic and the complexities of the various interfaces involved in acute clinical care. Derek has been a rock of support throughout the process.

I would also like to acknowledge the assistance of Professors Gary Smith and David Prytherch who provided a large vital signs data set from Portsmouth Hospitals NHS Trust and who undertook the performance analysis for NEWS upon which the early warning score weightings, triggers and escalation criteria were based. I am also indebted to the support, experienced opinion and impressive nursing representation from Rachel Binks and Lesley Durham.

I have been heartened throughout by the interest and for the most part enthusiasm from so many national groups, professional societies and stakeholders – their input and critique has been insightful and invaluable. The many more that have played a key part in developing the NEWS are acknowledged at the beginning of the document. Finally, I would like to thank the current president of the RCP, Sir Richard Thompson, and the registrar Dr Patrick Cadigan for their continued support and encouragement in the later stages of this work. Thanks also to Tracy Scollin for her sterling work from beginning to end as the administrator for the working group. The baton now passes from the few to the many who must make this work for patients.

Bryan Williams MD FRCP
Professor of medicine, University College London
Chairman of the NEWS Development and Implementation Group
Royal College of Physicians, London

Executive summary

Background

Early detection, timeliness and competency of clinical response are a triad of determinants of clinical outcome in people with acute illness. Numerous recent national reports on acute clinical care have advocated the use of so-called 'early warning scores' (EWS), ie 'track-and-trigger systems' to efficiently identify and respond to patients who present with or develop acute illness. A number of EWS systems are currently in use across the NHS, however, the approach is not standardised. This variation in methodology and approach can result in a lack of familiarity with local systems when staff move between clinical areas/hospitals – the various EWS systems are not necessarily equivalent or interchangeable. Put simply, when assessing acutely ill patients using these various scores, we are not speaking the same language and this can lead to a lack of consistency in the approach to detection and response to acute illness. This lack of standardisation also bedevils attempts to embed a culture of training and education in the assessment and response to acute illness for all grades of healthcare professionals across the NHS. Building upon recommendations in the RCP's Acute Medicine Task Force report *Acute medical care: the right person, in the right setting – first time*, published in 2007, the RCP commissioned a multidisciplinary group to develop a National Early Warning Score (NEWS).

Remit

The remit of this group was to develop a NEWS system that could be adopted across the NHS to provide a standardised track-and-trigger system for acute illness in people presenting to, or within hospitals. The remit also included the need for recommendations on the urgency of the clinical response required, the clinical competency of the clinical responders and the most appropriate environment for ongoing clinical care, according to the NEWS.

National Early Warning Score

The NEWS, like many existing EWS systems, is based on a simple scoring system in which a score is allocated to physiological measurements already undertaken when patients present to, or are being monitored in hospital. Six simple physiological parameters form the basis of the scoring system:

i) respiratory rate

ii) oxygen saturations

iii) temperature

iv) systolic blood pressure

v) pulse rate

vi) level of consciousness.

A score is allocated to each as they are measured, the magnitude of the score reflecting how extreme the parameter varies from the norm. The score is then aggregated. The score is uplifted for people requiring oxygen. It is important to emphasise that these parameters are already routinely measured in hospitals and recorded on the clinical chart.

Evaluation of NEWS

During its development, the NEWS was evaluated against a variety of other early warning systems currently in use. NEWS was shown to be as good at discriminating risk of acute mortality as the best of existing systems and better than others. Furthermore, at the recommended trigger levels for a clinical alert, NEWS is more sensitive than most existing systems. This means NEWS will provide an enhanced level of surveillance and clinical review of patients with greater specificity in identifying those at risk of clinical deterioration. Experience of the use of NEWS in clinical practice will allow ongoing evaluation of its performance and refinement, if required.

Using NEWS

This report advocates that the NEWS should be used to standardise the assessment of acute-illness severity when patients present acutely to hospital and also in the prehospital assessment ie by primary care and the ambulance services. It is also recommended that the NEWS is used as a surveillance system for all patients in hospitals, tracking their clinical condition, alerting the clinical team to any clinical deterioration and triggering a timely clinical response.

The NEWS clinical observations chart

To facilitate standardisation and a national unified approach, a colour-coded clinical chart has been developed which we propose is used across the NHS to record routine clinical data and track a patient's clinical condition. This tracking system will alert the clinical team to any untoward clinical deterioration and also clinical recovery. This in turn should determine the urgency and scale of the clinical response.

Clinical response to NEWS

Depending on the NEW score, the report provides recommendations for the frequency of clinical monitoring, the urgency of clinical review and the competency requirements of the clinical team needed to undertake that review. The report emphasises the importance of ensuring that acute care response teams with the appropriate competencies in acute clinical care are clearly defined, free of other clinical responsibilities and available 24/7 in acute hospitals. Furthermore, for those patients with the highest NEW score, ie the most seriously ill, the report provides recommendations regarding the most appropriate clinical environment for ongoing critical care.

The NEWS provides the basis for a unified and systematic approach to the first assessment of acutely ill patients and a simple track-and-trigger system for monitoring clinical progress for all patients in hospitals. This is allied to recommendations on the urgency and competency of the clinical response, as well as the most appropriate environment for ongoing care of the most acutely ill patients. In so doing, the NEWS provides a template for the staff and infrastructure requirements for modern acute clinical care.

NEWS and training and education

The NEWS provides the basis for standardising the training and credentialing of all staff engaged in the care of patients in hospitals and the prehospital assessment of patients. We recommend that this should also be extended to undergraduate education of medical, nursing and allied healthcare professionals.

NEWS, national clinical outcomes data and research and innovation

Finally, adopting NEWS nationally would also provide valuable standardised data on regional variations in illness severity and resource requirements, as well as objective measurements of illness severity and clinical outcomes – the latter providing an invaluable research resource to evaluate the efficacy of new systems of care and interventions.

Conclusion

The key message from this report is the potential for the NEWS to drive a step change improvement in safety and clinical outcomes for acutely ill patients in our hospitals by standardising the assessment and scoring of simple physiological parameters and adopting this approach across the NHS.

Recommendations

1. We recommend that the routine clinical assessment of all adult patients (aged 16 years or more) should be standardised across the NHS with the routine recording of a minimum clinical data set of physiological parameters resulting in a National Early Warning Score (NEWS).

2. We recommend that the NEWS is used to improve the following:

   i) the assessment of acute illness

   ii) the detection of clinical deterioration, and

   iii) the initiation of a timely and competent clinical response.

3. The NEWS **should not** be used in children (ie, aged <16 years) or women who are pregnant because the physiological response to acute illness can be modified in children and by pregnancy. Furthermore, the chronically disturbed physiology of some patients with chronic obstructive pulmonary disease (COPD) could influence the sensitivity of the NEWS, which should be recognised when interpreting NEWS in these patients.

4. We recommend that the NEWS be used as an aid to clinical assessment and not as a substitute for competent clinical judgement.

5. The NEWS should be used for initial assessment of acute illness and for continuous monitoring of a patient's well-being throughout their stay in hospital. By recording the NEWS on a regular basis, the trends in the patient's clinical responses can be tracked to provide early warning of potential clinical deterioration and provide a trigger for escalation of clinical care. Likewise, the recording of the NEWS trends will provide guidance about the patient's recovery and return to stability, thereby facilitating a reduction in the frequency and intensity of clinical monitoring towards patient discharge.

6. The NEWS should be considered for implementation in prehospital assessment of acutely ill patients by 'first responders' eg the ambulance services, primary care and community hospitals, to improve the communication of acute-illness severity to receiving hospitals.

The NEWS physiological parameters and scoring system

7. We recommend that the score should be determined from seven parameters (six physiological plus one weighting score for supplemental oxygen):

   – **Six physiological parameters routinely recorded:** i) respiratory rate, ii) oxygen saturations, iii) temperature, iv) systolic blood pressure, v) pulse rate and vi) level of consciousness.

   – In addition, **a weighting score of 2 should be added for any patient requiring supplemental oxygen** (oxygen delivery by mask or nasal cannulae).

8. Each of the six NEWS physiological parameters should be allocated a score reflecting the magnitude of disturbance to each of the physiological parameters. The individual parameter scores should then be combined with a score for use of supplemental oxygen to derive the aggregate NEWS score for the patient.

9. We recommend three trigger levels for a clinical alert requiring clinician assessment based on the NEWS:

- a **low score:** an aggregate NEW score of 1–4
- a **medium score:** a NEWS aggregate score of 5 or more, or a RED score, ie an extreme variation in an individual physiological parameter (a score of 3 in any one parameter which is colour-coded RED on the observation chart)
- a **high score:** an aggregate NEW score of 7 or more.

10. These triggers should determine the urgency of the clinical response and the clinical competency of the responder/s.
    - A **low score** (NEW score 1–4) should prompt assessment by a competent registered nurse who should decide if a change to frequency of clinical monitoring or an escalation of clinical care is required.
    - A **medium score** (ie NEW score of 5–6 or a RED score) should prompt an urgent review by a clinician skilled with competencies in the assessment of acute illness – usually a ward-based doctor or acute team nurse, who should consider whether escalation of care to a team with critical-care skills is required (ie critical care outreach team).
    - A **high score** (NEW score of 7 or more) should prompt emergency assessment by a clinical team/critical care outreach team with critical-care competencies and usually transfer of the patient to a higher dependency care area.

The NEWS chart

11. We recommend the use of a standardised NEWS observation chart for the routine recording of clinical observations, across the NHS.

12. The NEWS chart should replace the wide variety of temperature, pulse and respiratory rate (TPR) charts currently in use, to provide a standardised system for recording routine clinical data for all patients in hospital. A consistent format will provide easier recognition of patient data, and facilitate national training in the measurement and recording of such data for all NHS staff (**http://tfinews.ocbmedia.com**).

13. The NEWS chart should be colour-coded (Red, Amber, Green – RAG coded) to provide both visual and numeric prompts to aid identification of abnormal clinical parameters.

14. The core of the NEWS chart for recording and scoring the NEWS physiological parameters should be consistent nationally, but it is recognised that components of the chart area must reflect other key parameters not incorporated in the score, including urine output and pain scores.

15. The NEWS should be used alongside validated scoring systems such as the Glasgow Coma Scale or disease-specific systems as dictated by patient need.

Using NEWS in clinical practice

16. We recommend that the NEWS is used to determine the urgency of clinical response and the clinical competency of the responder/s to acute-illness severity for patients in hospitals, or in prehospital assessment.

17. Concern about a patient's clinical condition should always override the NEWS if the attending healthcare professional considers it necessary to escalate care.

18. Clinical response to the NEWS should be recorded on the chart. This will provide a continuous record of actions taken in response to variations in the NEWS and act as a prompt for escalating care if necessary.

19. When clinical teams decide that the routine recording of data for the NEWS is not appropriate, eg patients on an end-of-life care pathway, such decisions should be discussed with the patient and recorded in the clinical notes.

Clinical response to the NEWS

20. The organisation of the clinical response to acute illness should be reviewed and agreed locally to ensure that the speed of response and clinical competency of the responders match that recommended for each of the three grades of acute-illness severity as defined by the NEWS.

21. We recommend that in acute hospitals, local arrangements should ensure an agreed response to each NEWS trigger level and should define:
    - the speed/urgency of response to acute illness, including a clear escalation policy to ensure that an appropriate response always occurs and is guaranteed 24/7
    - who responds, ie the seniority and clinical competencies of the responder/s
    - the appropriate settings for ongoing acute care, including availability of facilities, trained staff and timely access to higher dependency care, if required
    - the frequency of subsequent clinical monitoring.

Clinical competencies of the responders to NEWS

22. All healthcare staff recording data for, or responding to, the NEWS should be trained in its use and should understand the significance of the scores with regard to local policies for responding to the NEWS triggers and the clinical response required.

23. The clinical responders to medium or high NEWS triggers should have the appropriate skills and competencies in the assessment and clinical management of acute illness.* Team members should be clearly identified and provide coverage 24/7.

24. There should be locally agreed mechanisms for timely alert of the critical care teams responding to a high NEW score. Members of these teams should have overriding responsibility to this role with regard to other duties, 24/7.

The NEWS and clinical settings for acute clinical care

25. The NEWS should be used to aid decision-making with regard to the most appropriate clinical setting for ongoing care. Local policies should define pathways for efficient and seamless escalation and transfer of care, including:
    - access to clinical monitoring, ie monitored beds, with staff trained to interpret and respond appropriately

*www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_096989

- timely access to staff trained in critical care, ie airway management and resuscitation and when required, access to higher dependency/critical care beds
- timely access to specialist acute care, ie acute cardiac, respiratory, liver or renal support.

The NEWS and frequency of clinical monitoring

26. The NEWS should be used to inform the frequency of clinical monitoring, which should be recorded on the NEWS chart.

27. We recommend that for those scoring 0, the minimum frequency of monitoring should be 12 hourly, increasing to 4–6 hourly with scores of 1–4, unless more or less frequent monitoring is considered appropriate by a competent clinical decision-maker.

28. We recommend that the frequency of monitoring should be increased to a minimum of hourly for those patients with a NEW score of 5–6, or a RED score (ie a score of 3 in any single parameter) until the patient is reviewed and a plan of care documented.

29. We recommend continuous monitoring and recording of vital signs for those with a NEWS aggregate score of 7 or more.

Education and training in the use of NEWS

30. Education, training and demonstrable competency in the use of NEWS should be a mandatory requirement for all healthcare staff engaged in the assessment and monitoring of acutely ill patients across the NHS.

31. We recommend that education regarding NEWS should form part of undergraduate nursing, paramedical and medical training.

32. We recommend that the clinical responders to medium NEW scores must have competency in the assessment of acutely ill patients. Responders to a high NEW score must also have competency in critical-care skills and airway management.

Research and development

33. NEWS should be evaluated in practice to determine if the recommended scoring template and trigger thresholds are optimal and refined if needed.

34. Future research should be directed towards evaluating the effectiveness of the NEWS in improving clinical response times and clinical outcomes in patients with acute illness.

1 Background and introduction

When a patient is acutely unwell and presents to hospital, or deteriorates and becomes acutely unwell whilst in hospital, time is of the essence and a fast and efficient clinical response is required to optimise clinical outcomes. Current evidence suggests that the triad of i) early detection, ii) timeliness of response, and iii) competency of the clinical response, is critical to defining clinical outcomes.[1–7]

A number of recent national reports, including those from the National Institute for Health and Clinical Excellence (NICE) and the RCP's Acute Medicine Task Force, have highlighted the importance of a systematic approach and advocated the use of so-called 'early warning scores' (EWS), or 'track-and-trigger systems', to efficiently identify and respond to patients who present with or develop acute illness.[8–10] These reports emphasise that the clinical response to the acutely ill patient could be substantially improved by the routine embedding of simple systems based on two key requirements:

i) a systematic method to measure simple physiological parameters in all patients to allow early recognition of those presenting with acute illness or who are deteriorating, and

ii) a clear definition of the appropriate urgency and scale of the clinical response required, tailored to the level of acute-illness severity.

To deliver these objectives, appropriate training and education is required.

The initial assessment and quantification of acute-illness severity need not be complex. Indeed, if it is to be practically deployed across all healthcare systems and utilised by all healthcare professionals, then the approach must be pragmatic but sufficient. Illness severity can be quantified by measurement of a combination of simple physiological parameters such as respiration rate, oxygen saturations, temperature, systolic blood pressure, pulse rate and level of consciousness – all of which are easily recorded during routine patient assessment. Based on these simple physiological measurements, there are now many 'early warning scores' or 'track-and-trigger systems' in use worldwide.[7] These vary in complexity ranging from single physiological parameter scores through to multiple parameter, aggregate-weighted and a combination of these systems.[11–13] These scores have been used to determine the speed and level of clinical response required for an individual patient. In the setting of acute illness, these scoring systems have also been shown to be a good predictor of patient mortality and hospital length of stay.[1–7]

The National Confidential Enquiry into Patient Outcome and Death (NCEPOD) 2007 report titled *Emergency admissions: a journey in the right direction?* recommended that: 'A clear physiological monitoring plan should be created for each patient commensurate with their clinical condition. This should detail what is to be monitored, the desirable parameters and the frequency of observations. This should be regardless of the type of ward to which the patients are transferred'.[9]

The NCEPOD report did not, however, emphasise the importance of standardising the physiological monitoring plan which we believe is critical to facilitate education and training in the initial assessment and continuous monitoring of acutely ill patients in hospitals across the NHS. Thus, a key principle of this new report is that the standardisation of assessment and response to acute illness would provide a 'step change' in acute care across the NHS.

A number of important factors needed to be considered when developing a national EWS:

- Which physiological parameters should be measured routinely and included in the scoring system?
- What weighting/score should be given to the magnitude of disturbance to each of these parameters?

- Should a clinical alert be based on an extreme variation of one parameter, or an aggregate score of all parameters, or a combination of both?
- At what 'score' should the clinical response be escalated, ie how sensitive is the trigger?
- What should be the nature of that response with regard to the clinical competencies of the responder?

From this list of considerations it is clear that the design of a standardised EWS posed a considerable challenge, not least of all to ensure (i) that the score was not so complex that it was never used, (ii) that the trigger was not too sensitive that it led to unnecessary alerts and which would overwhelm the clinical response teams, but also (iii) that the score was not so insensitive that these teams never responded at all. We also recognised that for a standardised NEWS to work, it must be supported by effective training for all healthcare professionals, thus permitting wide implementation using a common language.

Critical care outreach teams have long encouraged the adoption of EWS systems to enable a more timely response and assessment of acutely ill patients. Consequently a number of EWS systems have already been developed and widely implemented by hospitals across the NHS. However, we considered the current situation far from ideal for a number of reasons:

1. The various EWS systems currently being used in the NHS use a variety of different physiological parameters to derive their score. Moreover, the 'weighting' given to individual physiological parameters also differs between scoring systems. Consequently, clinical staff in different hospitals, or different clinical settings within the same hospital, often use different EWS systems and are not necessarily familiar with differences between the different systems.
2. Few local EWS systems have been formally evaluated to determine whether they accurately define acute-illness severity across a broad spectrum of acute clinical settings.
3. Where EWS systems are used, the frequency of monitoring and speed and magnitude of an 'appropriate clinical response' to a specific level of acute-illness severity has often been poorly defined and/or adhered to. Many hospitals using EWS systems do not have robust response systems in place, with the appropriate balance of staff trained in the clinical competencies required to adequately respond to a high score, especially 'out of hours'.
4. The potential for the use of EWS systems to standardise the assessment of acute-illness severity in the community and for prehospital setting has not been realised.
5. The absence of a nationally standardised approach to the detection and response to acute illness in hospitals has bedevilled attempts to embed standardised training in the assessment and response to the acutely ill patient, in the postgraduate and undergraduate settings.

The limitations of current clinical practice were recognised by the comprehensive Acute Medicine Task Force report from the RCP in 2007, that noted: 'A number of basic assessment tools or "early warning scores" are currently in use nationwide', and commented that 'there is no justification for the continued use of multiple different early warning scores to assess illness severity'.[10]

The Acute Medicine Task Force went on to recommend the following:

> *The physiological assessment of all patients should be standardised across the NHS with the recording of a minimum clinical data set resulting in a NHS early warning (NEW) score. This will provide a standardised record of illness severity and urgency of need, from first assessment and throughout the patient journey. This would allow consistent face-to-face assessment of illness severity across the NHS and provide a valuable baseline from which to evaluate the patient's clinical progress. It would also enhance good clinical practice, support standardised recording of vital data and provide an important source of*

documentation for audit of the quality of patient care. Furthermore, the development of NEWS would provide an important first step towards national unitary clinical documentation across all acute healthcare providers.[10]

The Acute Medicine Task Force report recognised that a key weakness in current practice was the lack of a standardised EWS embedded within the culture of the NHS. This lack of standardisation prevented the EWS being part of the routine training and education for all NHS staff. This has significant patient-safety implications that could be remedied by the establishment of a National Early Warning Score (NEWS) to be used by all staff as part of credentialing. We have adopted the term 'National' rather than 'NHS' for NEWS because we would like to see this culture of standardised recording of illness severity adopted both within and beyond the NHS.

Potential benefits of a National Early Warning Score (NEWS)

The key principle underpinning the recommendations in this report is standardisation. In developing the NEWS, there was the potential for endless discussions about which parameters should be included in the NEWS, the thresholds for each parameter within the scoring system and the scaling of the response to specific scores. Such discussions were important but could not be allowed to detract from our overarching principle that a system that reduced variation in care and improved communication would be overwhelmingly important in driving a 'step change' in the assessment and response to acute illness. Given the current variation in scoring systems, maintaining the status quo was not ideal. We recognised that the NEWS must be practical and 'user friendly' to enable its use across the NHS and also to encourage its wider use in other settings, eg in the prehospital assessment of patients with acute illness.

This report does not advocate a radical shift in the methods of assessment of illness severity, the basic principles already exist. The key message is standardisation of the approach and the widespread adoption of a single national EWS, ie NEWS.

The key principle underpinning the NEWS is standardisation.

Potential benefits of a standardised NEWS

The potential benefits of a standardised NEWS include:

- a single EWS system for early detection of the acutely unwell patient by measurement of specific physiological parameters in a standardised format
- a standardised score to determine illness severity to support consistent clinical decision-making and an appropriate clinical response
- the potential for standardisation of training and education in the detection and management of the acutely unwell patient and thus the ability to incorporate such training earlier into clinical careers
- the vehicle to adopt a standardised scoring system throughout the acute hospital, not solely in the context of acute clinical deterioration but also for continuous monitoring of all patients, providing a standardised means of identifying and responding to patients with unanticipated acute deterioration in their clinical condition whilst in hospital
- the opportunity to extend its application to prehospital assessment and standardise the assessment of acute illness in these settings.

The use of NEWS in all hospitals would also provide a standardised national platform to record defined levels of illness severity which would facilitate the development of simple acute-illness severity profiles to assist with (i) audit and planning of capacity and human resource needs and their allocation to match illness severity, and (ii) a powerful research tool to assess the impact of interventions, the quality of care and clinical outcomes.

NEWS – everybody is speaking a common language.

2 Methodology

The Royal College of Physicians commissioned their Acute Medicine Task Force team to convene a working group to develop NEWS – the NEWS Development and Implementation Group (NEWSDIG). The specific objective of the group was to develop a single EWS system that could be implemented across the NHS.

Remit of the NEWSDIG

The remit of this working party was:

- to develop a National Early Warning Score (NEWS) for use in adults
- to define the physiological parameters that would be included in the NEWS system, based on existing routine physiological measurements
- to define the weighting that should be applied to each of the parameters to derive the final aggregate NEW score
- to define the generic features of an appropriate scaled response to acute-illness severity as defined by the NEWS with regard to frequency of monitoring, the urgency of clinical response and levels of escalation of care
- to design a generic and standardised observation chart to record the NEWS parameters in routine clinical practice, and
- to develop an online training resource to support the implementation of NEWS.

Process of development

The process involved small group discussion meetings of the NEWDSIG to review existing EWS systems and related published literature and reports. This culminated in an initial draft report. The draft report was circulated to a wide group of national stakeholders (see Appendix A) for comment and suggestions to improve the initial draft. This review process led to a further draft report which was reviewed by the Council of the Royal College of Physicians, culminating in further recommendations for improvement and the production of this final report for publication.

The NEWSDIG reviewed a wide variety of EWS systems currently in use across the NHS. This was facilitated by a member of NEWSDIG (Professor Gary Smith) who had recently completed a review of the performance of 33 aggregate-weighted, track-and-trigger systems.[12] This provided the basis for discussions to determine the physiological components incorporated into existing EWS systems and the performance of these systems. The systems had many common features but also subtle differences with regard to the physiological parameters included, the number of parameters contained therein and the weightings given to each parameter. This in turn, influenced the performance of these systems in identifying acute illness.

It was clear from this literature review that the evidence base to guide the formulation of NEWS was somewhat limited and certainly not optimal. Furthermore, where published EWS systems were is use, in many cases local modifications had been applied. Also, when published systems were in use in different hospitals, the presentation of data on local charts differed in such a way that it was not obvious that the same EWS system was being used, creating the potential for confusion.

The group noted the uncertainty about how an EWS should be validated as there is no currently agreed standard. The NEWSDIG agreed that some method of pre-launch evaluation and validation was essential and there was much discussion about what was meant by 'validation' in this context. A number of important issues were considered, for example: What is the most appropriate outcome measure against which to validate an EWS system? Is it the efficiency of the system in predicting the clinical deterioration requiring an escalation of clinical care? Is it the sensitivity of the trigger and appropriateness of the escalation of care? Is it the avoidance of the need to transfer a patient to higher dependency care? Is it the ability of the EWS to predict in-hospital mortality or mortality over a longer period? Is it length of stay in hospital? Moreover, if the response is not standardised, how is it possible to know if the scoring system is working suboptimally, or simply compromised by the fact that the clinical response is inadequate. Put simply, unless the response is controlled for, it is difficult to evaluate the scoring system in isolation. It was clear that more robust research will be needed and it was also clear that adoption of a standardised NEWS would help facilitate and inform such research. That said, our guiding premise that such scoring systems, supported by educational programmes and implementation of more standardised response mechanisms, had the potential to improve the efficiency of acute care, triage and clinical outcomes, appeared to be well-grounded in evidence.[1–10]

Members of NEWSDIG discussed the various physiological parameters that might be included in a NEWS (see below). The group also noted that some EWS systems had solely used an aggregate score derived from the physiological parameters. This prompted discussion about what to do regarding an extreme variation in a single physiological parameter – should this be sufficient to act as a trigger for an urgent clinical review of the patient? Could we ignore extreme variation in a single parameter, accepting that this would be unusual, if the aggregate score was insufficient to trigger a medium or high score?

The NEWSDIG group finally agreed on six physiological parameters that should form the basis of the NEW scoring system. There was much discussion about the inclusion of oxygen saturations, especially about the practicality of their routine measurement. It was noted that the measurement of oxygen saturations is now commonplace in hospitals and prehospital assessment of acutely ill patients and the practicality of undertaking these measurements is now less of an issue than it had been previously. We also discussed how to handle the need for supplemental oxygen to maintain oxygen saturations. Until recently, this had not featured in many EWS systems but was considered by NEWSDIG to be important if oxygen saturations were to become incorporated into the NEWS.

Professor Smith shared recent information about a recently developed EWS (ViEWS) which included all six physiological parameters proposed for NEWS plus inspired oxygen concentration.[14] Following minor adjustments to this system and based on clinical opinion from the members of NEWSDIG, the final format for NEWS was agreed. Professors Smith and Prytherch then agreed to undertake an analysis of the performance of the NEWS using their extensive clinical database of bed-side physiological measurements that included a range of outcomes including death within 24 hours of assessment. This evaluation and validation of the NEWS versus other existing EWS systems is discussed in more detail below.

Formulating these recommendations in this report thus represented a balance of assessment of the available evidence, experienced clinical and professional judgment, patient and user opinion, evaluation and validation, and pragmatism – the latter being especially important. Our guiding principle was that if the NEWS was going to work in all acute-care settings across the NHS, including prehospital assessment, then it must be simple to implement and use measures that already exist. We acknowledge that this first iteration of the NEWS is only the beginning. As with all new innovations in healthcare, there is the inevitable need for a process of ongoing evaluation and evolution. This will be dependent on ongoing assessment and review of the performance of NEWS in clinical settings across the NHS. Further 'fine tuning' of the NEWS may be required, based on evaluation of the clinical data that will flow from its widespread use. This will be an essential national research stream flowing from the implementation of NEWS.

A key advantage of the NEWS is that it provides the essential first step on the road towards a standardised approach to track illness severity and trigger a timely and appropriate clinical response to acute illness for all patients. Without a standardised assessment tool of this kind, this was never going to happen. We consider this approach to the development, evolution and validation in use of the NEWS preferable to the current piecemeal adoption of multiple EWS systems in the NHS, without national review, standardised training in their use, or oversight of their suitability via objective audit of their performance. The development of a NEWS is the beginning, not the end of the process.

Finally the NEWSDIG group noted that the normal baseline for physiological parameters and the magnitude and character of the physiological response to acute illness often differs in children and in pregnancy. The NEWS has been **designed for use in adults aged 16 years and above**. It is not recommended for use in children or during pregnancy. Furthermore, the NEWSDIG recognised that the chronically disturbed physiology of some patients with eg COPD could affect the sensitivity of the NEWS.

From evidence to recommendations

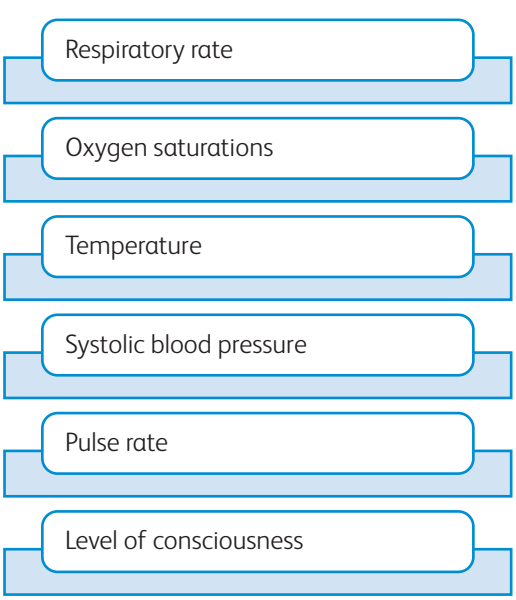
The NEWSDIG was conscious of the need to ensure that their recommendations for the NEWS were well grounded in evidence. The NEWSDIG noted that the benefits of using a system of recording routine physiological measurements as the basis of an early warning score to improve the detection of acute illness has been well established from previous published reports and had provided the evidence base for NICE recommendations (in CG50),[8] which recommended the adoption of such an approach to detect and respond to acute illness. The NEWSDIG adopted the same physiological parameters for the NEWS as recommended by the NICE report. The decision to add an additional weighting score for the use of supplemental oxygen was based on more recent literature reviews which suggested that this improved the precision of early warning scores systems at detecting acute illness severity. This was complemented by direct review of published data presented to the NEWSDIG by a member (Professor Gary Smith) from a comprehensive analysis of the performance of early warning scoring systems that included supplemental oxygen. Decisions with regard to the weighting given to the NEWS parameters were based on a published systematic review (see text) and review of normal ranges currently used by other early warning systems, and group discussion by the members of NEWSDIG. The performance of the NEWS system was formally evaluated against other early warning systems using the aforementioned comprehensive database, as discussed in the section of this document 'Evaluation of the NEWS' (page 15). Likewise, the sensitivity of the NEWS trigger was evaluated using the same database. These analyses of the performance and sensitivity and specificity of the NEW scoring system are planned for publication. Finally, the draft reports of NEWS were subject to extensive scrutiny by the members of the NEWSDIG, stakeholder groups (see Appendix A) and the Council of the Royal College of Physicians, London. This led to redrafts and clarifications. The NEWSDIG members noted throughout the process that the evidence base and criteria for assessment of early warning score systems is not as comprehensive as it should be and that few other early warning systems have undergone such extensive evaluation prior to launch as the NEWS. Furthermore, the NEWSDIG recommends that the performance of the NEWS should be further evaluated in practice and refined if needed.

3 Physiological parameters incorporated into the NEWS

There are many physiological parameters that could have been included in an acute-illness severity score. Many are already recorded routinely in patients in hospital, eg temperature, pulse and blood pressure. In addition, there are characteristics of individual patients such as age and gender that might influence physiological responses to acute illness and clinical outcomes. Thus, a simple concept such as the NEWS had the potential to become extremely complex and cumbersome in use. The NICE guideline, *The management of the acutely unwell patient*, adopted a pragmatic approach and recommended routine measurement of six physiological parameters to assess illness severity: pulse rate, systolic blood pressure, respiratory rate, oxygen saturations, level of consciousness and temperature.[8]

The working party agreed with the recommendations of the NICE report and concluded that **the routine recording of six physiological parameters should form the basis of the NEWS**. In addition for patients receiving supplemental oxygen, an additional score of 2 was agreed based on data from analyses conducted by Professors Smith and Prytherch. The six physiological parameters are all readily measured in patients, either in the prehospital or hospital setting and can be repeatedly measured to document trends and assess changes in illness severity.

Fig 1: Six physiological parameters included in the NEWS



It is uncommon for significant disturbance of a single physiological parameter to occur in isolation. Disturbances in multiple parameters in unison are more common and an aggregate of the magnitude of disturbance is a more robust measure of acute-illness severity.[12,14] Whilst this is true for a single assessment at baseline, even more can be gained by repeated measurements to define trends which can highlight deterioration or improvement in a patient's clinical condition. Significant disturbances in these six parameters are not necessarily unidirectional, thus upward and downward trends needed to be weighted and scored.

Review of the six physiological parameters

Respiratory rate

An elevated respiratory rate is a powerful sign of acute illness and distress, in all patients. The respiratory rate may also be elevated as a consequence of generalised pain and distress, sepsis remote from the lungs, central nervous system (CNS) disturbance and metabolic disturbances such as metabolic acidosis. A reduced respiratory rate is an important indicator of CNS depression and narcosis.

Oxygen saturations

The non-invasive measurement of oxygen saturation by pulse oximetry is routinely used in clinical assessment in the acute setting but until recently was less often incorporated into currently used EWS systems. As the routine measurement of oxygen saturations is now practical, it was considered to be an important parameter to include in the NEWS. Oxygen saturations are a powerful tool for the integrated assessment of pulmonary and cardiac function. The technology required for the measurement of oxygen saturations, ie pulse oximetry, is now widely available, portable and inexpensive. The NEWSDIG recommended that oxygen saturation measured by pulse oximetry should become a routine part of the assessment of acute-illness severity as part of the NEWS.

Temperature

Both pyrexia and hypothermia are included in the NEWS system reflecting the fact that the extremes of temperature are sensitive markers of acute-illness severity and physiological disturbance.

Systolic blood pressure

Although an elevated blood pressure (hypertension) is an important risk factor for cardiovascular disease, it is a low or falling systolic blood pressure (hypotension) that is most significant in the context of assessing acute-illness severity. Hypotension may indicate circulatory compromise due to sepsis or volume depletion, cardiac failure or cardiac rhythm disturbance, CNS depression, hypoadrenalism and/or the effect of blood pressure lowering medications. It is important to note that some people have a naturally low systolic blood pressure (<100 mmHg) and this might be suspected if the patient is well and all other physiological parameters are normal, or confirmed by reference to previous records of blood pressure. Hypertension is given less weighting in the context of acute-illness assessment. Severe hypertension, eg systolic blood pressure ≥200 mmHg, may occur as a consequence of pain or distress but it is important to consider whether the acute illness may also be a consequence of, or exacerbated by severe hypertension and take appropriate clinical action. Diastolic blood pressure does not form part of the scoring system for acute-illness severity because it does not add value in this context. However, diastolic blood pressure should be routinely recorded as it may be severely elevated and require treatment in some acute settings, ie accelerated hypertension.

Pulse rate

The measurement of heart rate is an important indicator of a patient's clinical condition. Tachycardia may be indicative of circulatory compromise due to sepsis or volume depletion, cardiac failure, pyrexia, or pain and general distress. It may also be due to cardiac arrhythmia, metabolic disturbance, eg hyperthyroidism, or drug intoxication, eg sympathomimetics or anticholinergic drugs.

Bradycardia is also an important physiological indicator. A low heart rate may be normal with physical conditioning, or as a consequence of medication, eg with beta-blockers. However, it may also be an important indicator of hypothermia, CNS depression, hypothyroidism or heart block.

Level of consciousness

Level of consciousness is an important indicator of acute-illness severity. We recommend the use of the already widely used Alert Voice Pain Unresponsive (AVPU) scale which assesses four possible outcomes to measure and record a patient's level of consciousness. The assessment is done in sequence and only one outcome is recorded. For example, if the patient responds to voice, it is not necessary to assess the response to pain.

Alert: a fully awake (although not necessarily orientated) patient. Such a patients will have spontaneous opening of the eyes, will respond to voice (although may be confused) and will have motor function.

Voice: the patient makes some kind of response when you talk to them, which could be in any of the three component measures of eyes, voice or motor – eg patient's eyes open on being asked, 'Are you okay?'. The response could be as little as a grunt, moan, or slight movement of a limb when prompted by voice.

Pain: the patient makes a response to a pain stimulus. A patient who is not alert and who has not responded to voice (hence having the test performed on them) is likely to exhibit only withdrawal from pain, or even involuntary flexion or extension of the limbs from the pain stimulus. The person undertaking the assessment should always exercise care and be suitably trained when using a pain stimulus as a method of assessing levels of consciousness.

Unresponsive: this is also commonly referred to as 'unconscious'. This outcome is recorded if the patient does not give any eye, voice or motor response to voice or pain.

New onset confusion: as indicated above, a patient may be confused but alert. Thus, assessment of confusion does not form part of the AVPU assessment. Nevertheless, **new onset or worsening confusion should always prompt concern about potentially serious underlying causes and warrants urgent clinical evaluation.**

Additional weighting of the NEWS aggregate score

Supplemental oxygen

Patients requiring supplemental oxygen are at greater clinical risk. Thus, the requirement for supplemental oxygen to maintain satisfactory oxygen saturations has been incorporated into the scoring system. The NEWSDIG recommended that **a weighting score of 2 should be added to the aggregate NEW score for any patient requiring supplemental oxygen.** Note that **'supplemental oxygen' here refers to routine oxygen delivery by mask or nasal cannulae.** When supplemental oxygen is required to maintain oxygen saturations, it should be formally prescribed and the target oxygen saturations defined for individual patients admitted to hospital as per the British Thoracic Society's (BTS) recommendations.[14]

Chronic obstructive pulmonary disease with known hypercapnic respiratory failure

For some patients with these conditions, excessive oxygen supplementation can cause respiratory depression which can be life threatening. For patients with COPD, oxygen saturations should be set

between 88–92% while monitoring arterial blood gases according to the BTS recommendations.[15] The NEWSDIG noted that the combination of low oxygen saturations and an additional score of 2 for supplemental oxygen is likely to trigger a medium NEWS level alert in some patients with COPD. This was not considered to be inappropriate as this will prompt review by a competent clinical decision-maker who can determine whether an escalation of clinical care is required, or document an override of the NEW score by recording that oxygen saturation values as the 'usual' values for specific patient and that further escalation is not required.

Another consideration in some COPD patients is that inappropriate oxygen supplementation could raise oxygen saturations above the target range, hence it is important that oxygen is prescribed according to the BTS guidelines[15] for patients with known COPD and respiratory failure. This emphasises the need for close monitoring and supervision of these patients.

The NEWSDIG recommended that patients requiring high flow oxygen, continuous positive airway pressure (CPAP) or non-invasive ventilation (NIV) to maintain their oxygen saturations require higher dependency care.

Physiological parameters considered but not included in the NEWS

The working party considered whether a number of other clinical and demographic parameters should be included in the NEW scoring and weighting system – these are discussed below. The NEWSDIG emphasised that the recommendation that these parameters are not recorded as part of the scoring system for the NEWS does not mean that they are unimportant, or that they should not be recorded and considered as part of the overall clinical evaluation of the patient.

Age

Older age is associated with higher clinical risk but the relationship between age and the physiological response to acute illness is complex. Moreover, chronological age is not always a good indicator of biological age. The working party was unconvinced that it was necessary to apply an arbitrary weighting to the NEWS aggregate score on the basis of age, based on current evidence.[16]

Urine output

The monitoring of urine output is important in many clinical settings. However, formal estimation of urine output is not always available at first assessment and measurement of urine output is not routine in the majority of patients in hospital. The NEWSDIG did not consider it practical or necessary for formal monitoring of urine output to be part of the scoring system for the NEWS. That said, **NEWSDIG recognised that urine output monitoring is essential for some patients** as dictated by their clinical condition/clinical setting and this has been included on the NEWS chart to highlight the importance of recording urine output when considered clinically appropriate to do so.

Pain

The symptom of pain must be recorded and responded to by the clinical team.

Pain and/or its cause will usually but not always generate physiological disturbances that should be detected by the scoring system for the NEWS. The NEWSDIG noted, that whilst the symptom of pain

should be routinely recorded and responded to, it should not form part of the aggregate score for the NEWS. However, **to encourage routine recording of pain symptoms, pain has been included as part of the NEWS observation chart.**

Gender, ethnicity and obesity

There was no evidence that these parameters have any significant influence on previously evaluated aggregate scoring systems. The working group recommended that gender, ethnicity or obesity should not form part of the weighting or scoring system for the NEWS.

Pregnancy

Physiological parameters and their response to illness are modified in pregnancy. The working group noted that existing EWS systems and the NEWS may be less reliable in estimating acute-illness severity in pregnancy and therefore the **NEWS should not be used in pregnancy.**

Comorbidities including immunosuppression

Comorbidities do impact on clinical outcomes. For many comorbidities, there are disease-specific scoring systems, the use of which is not precluded by the NEWS. Furthermore, the NEWS is designed to be generic and should reflect the physiological perturbations associated with various comorbidities. For this reason, the working group recommended that no additional weighting should be allocated to the NEWS aggregate score for comorbidities or for patients receiving immunosuppression.

4 How the NEWS works

Having defined the six physiological parameters that will be recorded for the NEWS, there were three additional considerations:

1. the scoring and weighting applied to the six physiological parameters
2. the trigger thresholds for single parameters or the aggregate score
3. the clinical response to the trigger, in terms of the urgency of response, the clinical competencies of the responder/s and the subsequent frequency of clinical monitoring.

Scoring system for the NEWS physiological parameters

Once measured and recorded, the six physiological parameters and the uplift for supplemental oxygen had to be weighted and aggregated to derive the NEW score. For each physiological parameter, a normal 'healthy' range was defined. Measured values outside of this range were allocated a score which was weighted and colour-coded on the observation chart according to the magnitude of deviation from the normal range. The weighting reflects the severity of the physiological disturbance. If supplemental oxygen is required to maintain oxygen saturations, two additional points are given to the aggregated NEW score.

The weighting allocated to each physiological parameter for a specific level of disturbance was critical in defining the sensitivity of the final aggregate score as a trigger for a clinical response. The working group reviewed the weightings used in a number of EWS systems, particularly ViEWS, and made adjustments, based on clinical opinion and practice from the members of NEWSDIG (Chart 1, next page). The performance of the NEWS was then evaluated relative to existing EWS systems as described below (see 'Evaluation of the NEWS', page 15).

Note on use of the charts

The charts in this report are free of copyright restrictions, but **for clinical use please download the full-size high-quality charts** available free from the RCP website: **www.rcplondon.ac.uk/national-early-warning-score**. All the charts must be downloaded in colour.

Chart 1: National Early Warning Score (NEWS)*

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

*The NEWS initiative flowed from the Royal College of Physicians' NEWSDIG, and was jointly developed and funded in collaboration with the Royal College of Physicians, Royal College of Nursing, National Outreach Forum and NHS Training for Innovation.

Royal College of Physicians

NHS Training for Innovation

Chart 1: The NEWS scoring system

In some settings, patients will have an impaired level of consciousness as a consequence of sedation, eg following surgical procedures. Thus, the assessment of consciousness level and the necessity to escalate care should be considered in the time-limited context of the appropriateness of the consciousness level in relation to recent sedation.

For patients with known hypercapnoeic respiratory failure due to COPD, recommended BTS target saturations of 88–92% should be used. These patients will still 'score' if their oxygen saturations are below 92 unless the score is 'reset' by a competent clinical decision-maker and patient-specific target oxygen saturations are prescribed and documented on chart and in the clinical notes.

All supplemental oxygen when administered, must be prescribed.

NEWS thresholds and triggers

Having defined the scoring template for NEWS (Chart 1), the NEWSDIG then had to define the thresholds for the triggering of a clinical response. This was critical to the performance of NEWS in terms of its ability to discriminate different levels of acute-illness severity and also the frequency of urgent clinical reviews that would be triggered. Clearly a system that was exquisitely sensitive but lacked the ability to discriminate which patients did and which did not require urgent clinical review would overwhelm hospitals and justifiably fall into disrepute. Likewise, a system that was too insensitive that the trigger was so infrequent that it missed the opportunity for early clinical intervention to improve a patient's deteriorating clinical condition would also fail to meet the key objective to improve care.

There was much discussion regarding the aggregate NEW scores that should trigger a medium- and high-level clinical alert. The conclusion was based on formal evaluation of the sensitivity of the NEWS

with regard to the frequency of clinical alerts at different aggregate NEW scores and the specificity of the NEWS relative to other EWS systems with regard to predicting in-hospital mortality (see below for evaluation of the NEWS).

Based on formal evaluation of the performance of the NEWS it was decided that a NEWS aggregate of 5–6 should trigger a medium-level clinical alert, ie an urgent clinical review; and a NEWS score of 7 or more should trigger a high-level clinical alert, ie an emergency clinical review. The NEWSDIG also recommended that an extreme score (ie 3) in any one physiological parameter, recorded as any RED score on the NEWS chart, should also trigger a medium-level alert (Chart 2).

Chart 2: NEWS thresholds and triggers

NEW scores	Clinical risk
0	Low
Aggregate 1–4	
RED score* (Individual parameter scoring 3)	Medium
Aggregate 5–6	
Aggregate 7 or more	High

The NEWS trigger system aligned to the scale of clinical risk

***RED score** refers to an extreme variation in a single physiological parameter (ie a score of 3 on the NEWS chart, coloured RED to aid identification and represents an extreme variation in a single physiological parameter). The consensus of the NEWSDIG was that extreme values in one physiological parameter (eg heart rate ≤40 beats per minute, or a respiratory rate of ≤8 per minute or a temperature of ≤35°C) could not be ignored and on its own required urgent clinical evaluation.

Evaluation of the NEWS

Evaluation of the specificity and sensitivity of the NEWS relative to existing EWS systems

There was no gold standard EWS system, nationally or internationally, against which to evaluate the NEWS scoring and weighting system. This presented a challenge with regard to the development and validation of a NEWS. Furthermore, it was not straightforward to define the most appropriate outcome measure for validation of an EWS system because the NEWS would be used for both initial assessment of acute-illness severity and as a track-and-trigger to identify acute clinical deterioration and the response. Professor Smith, a member of the NEWDSDIG, had established a clinical vital signs database at Portsmouth Hospitals NHS Trust that could be used for an initial evaluation of NEWS. This database comprised 198,755 data sets from 35,585 completed and consecutive patient episodes at a medical assessment unit of an acute hospital in the UK.[14]

The primary outcome for the analysis was death within 24 hours of a given observation set. This occurred in 1,999 patients (1% of male and 1% of female patients) and overall, 3,133 of the 35,585 (8.8%) of patient episodes ended in death. The ability of the NEWS to discriminate between survivors and non-survivors was assessed using an area under the receiver-operating characteristics (AUROC) curve.

Using in-hospital mortality within 24 hours of assessment as the outcome, the AUROC for the NEWS was 0.89 (95% CI: 0.880–0.895). This was a better performance than most existing EWS systems and consistent with the performance of ViEWS.[14]

A key difference between ViEWS and NEWS is that NEWS allows a trigger RED score of 3 for single extreme values of any physiological parameter, rather than solely based on an aggregate score. The decision to trigger on the basis of single extreme values was based on the clinical opinion of the group linked to patient safety and clinical governance.

Evaluation of the trigger thresholds for the NEWS relative to an existing EWS system

The NEWSDIG next considered the trigger thresholds for the NEWS. These thresholds determine the boundaries of the low-, medium- and high-risk categories defined by the NEWS, ie the sensitivity of the trigger. To do this Professor Smith undertook a further analysis of the clinical database collected over one year at the Portsmouth Hospitals NHS Trust. This analysis used this typical NHS acute-hospital setting to determine the percentage of measurement sets that triggered a response at different aggregate trigger levels for both NEWS and a typical Modified Early Warning Score (MEWS)[17] currently in use in the NHS. This analysis was undertaken in three clinical settings: (i) an acute medical unit (AMU) (81,010 observation sets from 12,476 patients), (ii) medical wards (283,288 observation sets from 8,937 patients), and (iii) surgical wards (197,715 observations sets from 7,801 patients). When the trigger for a medium alert was set at an aggregate score of 4, in the AMU this would trigger 28% of the time for NEWS and only 10% for MEWS. In the medical wards this would trigger 27% for NEWS and 8% for MEWS, in the surgical wards 16% for NEWS and 3% for MEWS. It was apparent that the NEWS aggregate score was a much more sensitive trigger than most other EWS systems. This in part reflects the uplift of the NEW scoring system for supplemental oxygen.

The NEWS trigger was then evaluated at an aggregate score of 5. The results indicated that a NEWS aggregate score of 5 would trigger for approximately 20% of data sets in AMU or medical wards and 10% in surgical wards. Thus, NEWS triggering at an aggregate score of 5 was still more sensitive than a typical EWS trigger system currently in use and set to trigger at 4, but crucially also more specific at detecting acute clinical deterioration as indicated by the AUROC data above.

NEWSDIG concluded that a NEWS aggregate score of 5 would prompt earlier clinical review of patients with acute illness in hospital, when compared to existing EWS systems and with greater discrimination to detect patients who require higher levels of medical monitoring and intervention.

The same analysis indicated that when the trigger for a high-level alert was set at an aggregate NEW score of 7, ~10% of data sets would prompt an alert on AMU or medical wards and ~4% on surgical wards. NEWSDIG noted that the full analysis of this data used to develop and evaluate the NEWS would be submitted for publication.

The NEWSDIG recognised that ultimately, the most effective way to formally evaluate the effectiveness of NEWS at improving clinical outcomes was to implement it into practice and evaluate its performance on a large scale. This would then lead to refinement as necessary. NEWSDIG also recognised that the overall performance of NEWS or any other EWS system is not solely dependent on the scoring system but the chosen outcome plus the sensitivity of the trigger thresholds and crucially, the organisation of the response.[11]

In summary, NEWS has been developed and evaluated against existing EWS systems. NEWS has been shown to be as good at discriminating risk of acute mortality as the best of them. NEWS is likely to be more sensitive than most currently used systems at prompting an alert and clinical response to acute-illness deterioration but with the huge potential added value of national standardisation in assessment and response. NEWSDIG concluded that NEWS had great potential to improve clinical outcomes.

5 Using the NEWS

We recommend that the NEWS be recorded during the initial prehospital and/or hospital assessment of a patient and throughout the patient's hospital stay, as part of the standard clinical observation chart across the NHS.

The NEWS should also be implemented in prehospital assessment of acutely ill patients by 'first responders', eg the ambulance services, to improve the communication of acute-illness severity to receiving hospitals.

During clinical assessment, the six NEWS physiological parameters should be recorded, each being allocated a score reflecting the magnitude of physiological disturbance. If supplemental oxygen is required to maintain oxygen saturations, two additional points are given to the aggregated physiological score, to give an individualised NEW score for the patient.

There should be two mechanisms for triggering a medical team review: an extreme variation in an individual physiological parameter, ie a RED score (ie a score of 3 in any one parameter), or more commonly, an aggregate NEW score of 5–6.

The NEWS should guide the clinical response and define whether an escalation of care is required or not. An escalation of care refers to the urgency of response and the clinical competencies of the team required to review and treat the patient's clinical condition. In some cases, for high scores, ie a NEWS score of 7 or more, this will often necessitate patient transfer to a higher dependency area.

The NEWS should be used to guide the frequency of patient monitoring and this should be recorded on the chart.

The NEWS should be used for continuous monitoring of a patient's well-being throughout their stay in hospital, not solely for the initial assessment of illness severity. By recording the NEWS on a regular basis, the trends in the patient's clinical response can be tracked providing early warning of clinical deterioration and the need for more intensive treatment. Likewise, the recording of the NEWS trends will provide guidance about the patient's recovery, facilitating a reduction in the frequency and intensity of clinical monitoring towards patient discharge.

Education and training and demonstrable competency in the use of NEWS should be a mandatory requirement for all healthcare staff, including undergraduates and paramedics.

The NEWS should be used as objective data to aid clinical decision-making – it is not a barrier or alternative to skilled clinical judgment. There will be circumstances when a healthcare professional judges that the NEW score underestimates their concern for the patient's clinical condition. In such circumstances, care must be escalated to a more senior clinical decision-maker. In circumstances in which the healthcare professional feels the NEW score may be overestimating the severity of a patient's clinical condition, they should also escalate decision-making to a more senior decision-maker within the clinical team to determine if escalation of care is warranted or not.

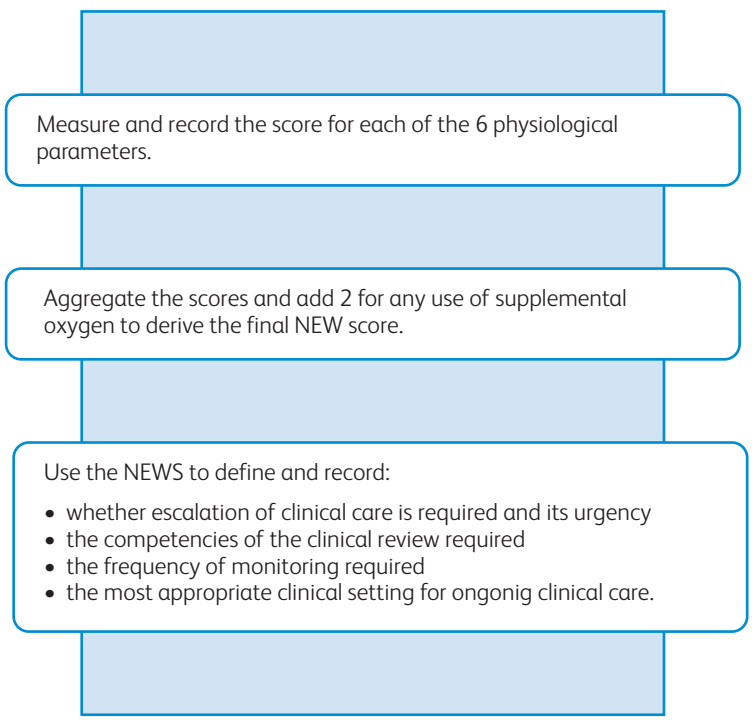
We recommend that reasons not to act on the NEW score should be recorded in the clinical notes.

When clinical teams decide that the routine recording of data for the NEWS is not appropriate, eg for patients on an end-of-life care pathway, such decisions should be discussed with the patient and recorded in the notes.

Whoever records the physiological data for the NEWS should be trained to accurately measure the physiological parameters, understand the significance of the NEWS and the response policies for changing the frequency of monitoring and escalating clinical care.

The NEWS system will only work if:

- the staff undertaking the routine measurements are trained in its use
- response systems and staff are in place to deliver the recommended urgency of response by a clinical team with an appropriate level of clinical competence.



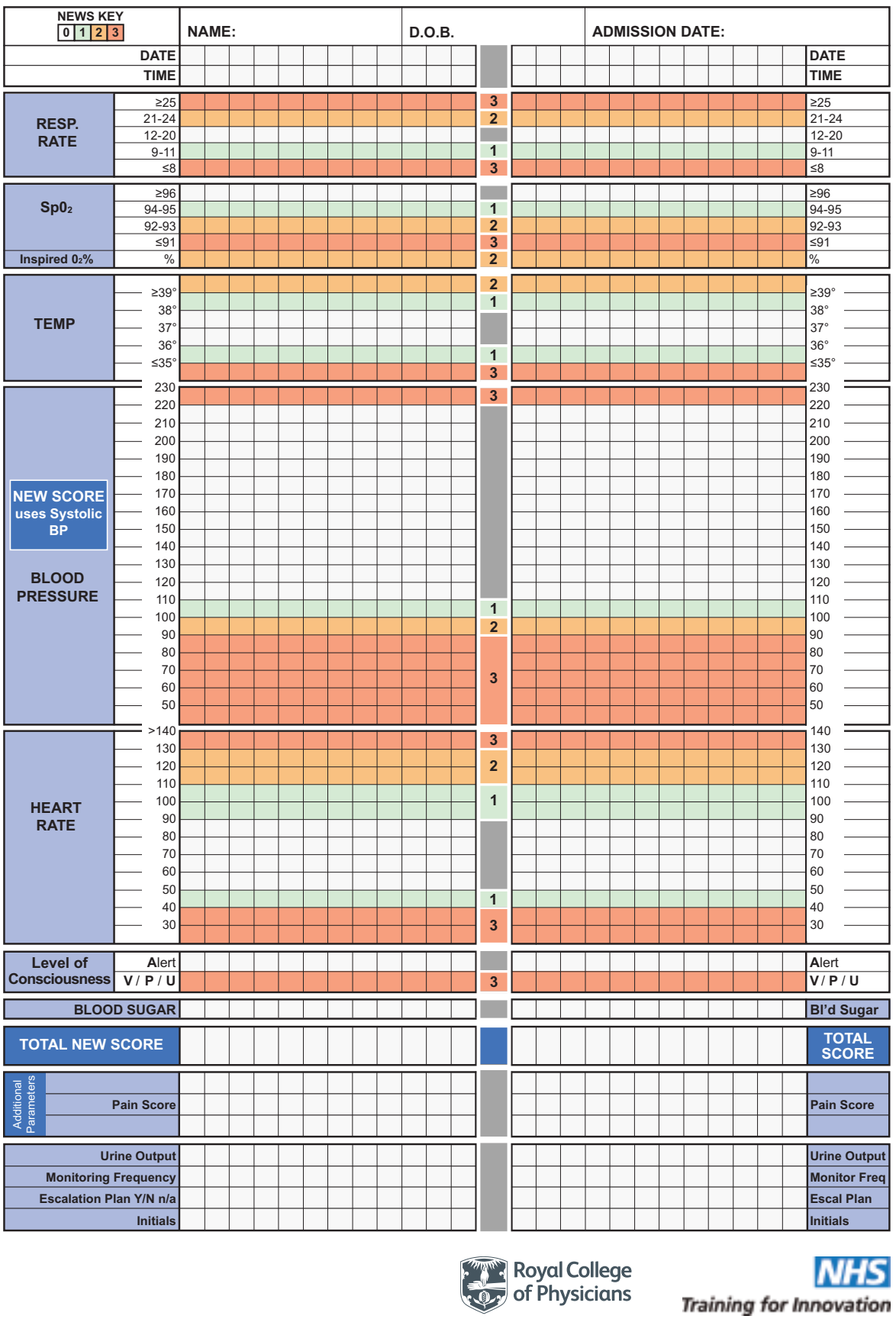
The NEWS chart (see Chart 3, page 20)

Across the NHS, many different charts have been designed to record routine physiological measurements, but there is no standardised approach to chart design. This presents problems in standardising training. It also engenders a lack of familiarity with data presentation in the clinical setting when staff or patients relocate to different clinical areas. The RCP's Acute Medicine Task Force report in 2007 recommended the development of 'standardised documentation' for the NHS for 'inpatient basic observation charts … which could be part of the NEW scoring system'. It further said that 'there seems to be little, if any, justification for individual hospitals, or other healthcare providers, investing in the development of customised documentation'.[10] Once again, the principle underpinning this recommendation was standardisation.

The NEWSDIG decided to develop a generic NEWS chart to support improved clinical documentation and communication. The NEWSDIG recognised the need for expert input in chart design and commissioned the NHS Training for Innovation team to work with members of NEWSDIG, including representation from the Royal College of Nursing and the National Outreach Forum, to develop a standardised generic NEWS chart that would be suitable for downloading for use by clinical teams across the NHS. Alongside, an online training package focused on the use of NEWS has been developed to facilitate implementation (**http://tfinews.ocbmedia.com**).

- We recommend use of a standardised NEWS chart for the routine recording of clinical data, across the NHS.
- The NEWS chart should replace currently used TPR charts. This would provide a standardised system for recording routine clinical data for all patients in hospital. This consistent format, if used in all hospitals, would provide familiarity in recognition of patient data and facilitate training in the measurement and recording of such data in a systematic and standardised way by all NHS staff.
- We recommend that the NEWS chart should be colour-coded to aid identification of abnormal clinical parameters as they are measured and entered onto the chart. Colour-coding of the NEWS charts will provide a visual prompt as well as a numeric score of illness severity. The charts should not be photocopied in black and white for clinical use.
- When the measured physiological parameter exceeds the range on the chart, the actual value should be recorded on the chart.
- The NEWS chart contains dedicated sections to record the frequency of monitoring as defined by the score and the clinical response to a change in score, eg an escalation in acute care – this will facilitate tracking of the response to changes in the NEW score.
- The NEWS chart also contains dedicated sections to record urine output and pain severity. These do not form part of the NEW score.
- We recommend that the NEWS chart for recording and scoring the NEWS physiological parameters should remain consistent and standardised across the NHS.
- The NEWS is not designed to replace recognised generic scoring systems such as the GCS or disease-specific systems.
- NEWS charts are available for free download at the RCP website (**www.rcplondon.ac.uk/national-early-warning-score**) and also at **http://tfinews.ocbmedia.com**.

Chart 3: Observation chart for NEWS



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NOTE: This chart is too small for clinical use. To download a full-size high-quality observation chart, go to **www.rcplondon.ac.uk/national-early-warning-score**

Clinical response to NEWS (see Chart 4, page 24)

When a patient initially presents with an acute illness, or suffers an acute deterioration in their clinical condition whilst in hospital, the NEWS should be used to help determine urgency and scale of the clinical response required.

The clinical response to NEWS has three key elements:

- the urgency of response
- the seniority and clinical competencies of clinical staff required to attend to the patient
- the setting in which the ongoing clinical care should be delivered.

In 2007, the NICE guideline *Acutely ill patients in hospital: recognition of and response to acute illness in adults in hospital* recommended that, 'A graded response strategy for patients identified as being at risk of clinical deterioration should be agreed and delivered locally'.[8] It went on to recommend that the response should be graded around three levels:

i) **low-score** group

ii) **medium-score** group

ii) **high-score** group.

NICE did not think it appropriate to recommend a specific configuration for the organisation of the response to a specific score, but instead provided generic guiding principles.[8] NEWSDIG concurred with these conclusions of the NICE report.

We recommend that the clinical response to NEWS should be agreed locally and organised around **three graded triggers (low, medium, high)**.

We recommend that the locally agreed response to each NEWS trigger level should define:

- the speed/urgency of response – to include an escalation process to ensure that a response always occurs
- who responds, ie the seniority and clinical competencies of the responder/s
- the appropriate clinical setting for ongoing acute care
- the frequency of subsequent monitoring of the patient.

Organisation of the local response to NEWS

The NEWS grading system is designed to enable clinical staff to recognise and respond to acute illness and/or acute clinical deterioration and to trigger different levels of clinical response, proportionate to illness severity.

We recommend that the NEWS grading system is used to determine the clinical response to acute-illness severity in hospitals, or in a prehospital assessment.

Clinical concern about a patient's condition should always override the NEW score if the attending healthcare professional considers it necessary to escalate care.

In hospitals, the clinical response to acute deterioration in a patient's clinical condition currently involves a wide range of clinical staff, including ward-based nursing staff, junior and senior medical staff,

hospital-at-night teams, critical care outreach teams and cardiac arrest teams. The composition of the response teams will depend on the size of the hospital and the complexity of their casemix and should be defined locally.

The evaluation of NEWS (see Chapter 4) provides an indication of the potential workload impact with regard to clinical responders to medium and high NEW scores. This analysis indicates that in a typical large acute-hospital setting, ~20% of observation sets may record a NEW score of 5 or more and prompt a medium-level alert, with ~10% of observation sets potentially scoring 7 or more, thereby prompting a high-level alert.

We recommend that the clinical response to acute-illness severity should be reviewed and agreed locally to ensure that the speed of response and clinical competency of the responders matches that recommended for each of the three grades of acute-illness severity as defined by the NEWS.

We recommend that local arrangements should ensure that:

1. the urgency and competency of response to acute illness is guaranteed 24/7
2. there are appropriate settings, facilities and trained staff in place for ongoing care, when it is necessary to escalate care to higher dependency settings.

Urgency of response

The speed and urgency of response to acute illness has been consistently shown to be a critical determinant of clinical outcomes.

We recommend that the processes for alerting clinical staff and ensuring a timely clinical response should be agreed locally and clearly defined as an overriding responsibility for all staff alerted to a patient with an acute deterioration in their clinical condition.

Frequency of clinical monitoring

The NEWS should be used to inform the frequency of clinical monitoring (Chart 3). The NEWS chart contains a section to record the frequency of monitoring as guided by the NEW score.

The frequency of monitoring should be dictated by the patient's clinical condition and stability. NICE in its guidance in 2007 recommended a minimum frequency of 12-hourly monitoring.[8] The group considered this reasonable for a small group of patients but discussed the fact that more frequent monitoring (eg 6 hourly) is likely to be required earlier in the course of a patient's acute-hospital admission. NEWSDIG concluded that 12-hourly monitoring was very much a minimum and noted that many patients would require more frequent monitoring.

We recommend that for those in the low-score group, the minimum frequency of monitoring should be 12 hourly, increasing to 4–6 hourly for NEWS aggregate scores of 1–4, unless more or less frequent monitoring was considered appropriate by a competent or senior clinical decision-maker.

We recommend that the frequency of monitoring should be increased to a minimum of every hour for those patients with a NEWS aggregate score of 5–6, or a RED score of 3 in a single parameter.

Whilst any patient can be considered for continuous monitoring, it is essential for patients with a score of 7 or more.

Appropriate setting for ongoing clinical care

The NEWS should be used to aid decision-making regarding the clinical setting for ongoing care, including:

i) access to facilities for more frequent clinical monitoring, ie monitored beds with staff trained to interpret and respond

ii) timely access to staff trained in critical care, ie airway management and resuscitation

iii) timely access to specialist acute care, ie acute cardiac, liver or renal support.

Local policies should be in place to define pathways for efficient and seamless escalation and transfer of care when required.

Clinical competencies of responders to NEWS

NEWSDIG noted that the Department of Health (DH) has published a framework of the competencies for recognising and responding to acutely ill patients in hospital. This document should be referred to for a detailed description of the competency framework that underpins the recommended graded clinical response to the NEWS. This framework was produced in response to the NICE guideline CG50[8] and these reports noted that, 'staff caring for patients in any acute-hospital setting should have competencies in monitoring, measurement and interpretation of vital signs, equipping them with the knowledge to recognise deteriorating health and respond effectively to acutely ill patients'. The NEWSDIG supported the underlying principles of these DH and NICE reports that the competencies should be built around the 'chain of response' reflecting escalating levels of intervention in the care of an acutely ill patient, corresponding to low, medium and high track-and-trigger scores and that the response should be 'effective, timely and seamless'.

The key elements of the 'chain of response' are: the recorder, the recogniser and the responder. The responder can be further subdivided according to the clinical competencies in acute care required to deliver an effective response, ie the primary responder, secondary responder, and the tertiary responder – the latter with competencies in critical care (see Chart 4).

The clinical competencies of responders to NEWS should include the following:

- All healthcare staff recording data, or responding to the NEWS should be trained in its use.
- All staff using NEWS should understand the significance of the scores with regard to local policies for responding to the NEWS triggers and the clinical response required.
- We recommend that for patients with medium NEW scores, the locally agreed responder/s must have clinical competency in the assessment and treatment of acutely ill patients and in recognising when escalation of care to critical care teams is appropriate.
- For patients with high NEW scores, the locally agreed response must include staff with critical-care skills, including airway management.
- The staff/team/s with the appropriate skills and competencies to respond to medium or high NEWS triggers, should be identified on the local rota and the rota should provide coverage 24/7.
- There should be a locally agreed mechanism for the timely alert of the critical care team/s and their response should have overriding responsibility with regard to other duties.

Chart 4: Clinical response to NEWS triggers

NEWS SCORE	FREQUENCY OF MONITORING	CLINICAL RESPONSE
0	Minimum 12 hourly	• Continue routine NEWS monitoring with every set of observations
Total: 1-4	Minimum 4-6 hourly	• Inform registered nurse who must assess the patient; • Registered nurse to decide if increased frequency of monitoring and / or escalation of clinical care is required;
Total: 5 or more **or** **3 in one parameter**	Increased frequency to a minimum of 1 hourly	• Registered nurse to urgently inform the medical team caring for the patient; • Urgent assessment by a clinician with core competencies to assess acutely ill patients; • Clinical care in an environment with monitoring facilities;
Total: 7 or more	Continuous monitoring of vital signs	• Registered nurse to **immediately** inform the medical team caring for the patient – this should be at least at Specialist Registrar level; • Emergency assessment by a clinical team with critical care competencies, which also includes a practitioner/s with advanced airway skills; • Consider transfer of Clinical care to a level 2 or 3 care facility, i.e. higher dependency or ITU;

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Where a patient is being continuously monitored invasively or non-invasively, a full set of vital signs data should be charted using the 'minimum interval' algorithm (eg for a patient with a previous NEWS of 5, data from a continuous device must be charted at least hourly).

At all levels of NEWS, but particularly at levels of 7 or above, clinical staff should consider the 'ceiling of care' including the suitability of CPR.

6 Training and implementation of the NEWS

One of the key advantages of NEWS is a standardised system for the education, training and credentialing of healthcare professionals.

We recommend that education and training and demonstrable competency in the use of NEWS should be a mandatory requirement for all healthcare staff engaged in the assessment and monitoring of acutely ill patients across the NHS.

We also recommend that the NEWS should form part of undergraduate nursing, paramedical and medical training.

A training document and web-based educational tools to support the implementation of the NEWS in a variety of formats are available at **http://tfinews.ocbmedia.com**.

7 Future research

The NEWS provides the opportunity to standardise data collection regarding the severity of acute illness across the NHS to aid resource and infrastructure planning and service delivery organisation. This in turn provides the opportunity to link the NEWS to the measures of the efficiency of clinical response and the effectiveness of that response in improving outcomes for patients with acute illness. The NEWSDIG recognised the important and considerable challenge in evaluating the effectiveness of NEWS in this context. Ongoing evaluation is required to determine whether the trigger is sufficiently sensitive to alert the appropriate clinical response but not too sensitive that it results in unnecessary alerts. Furthermore, much work is needed to define the appropriate clinical outcomes against which to benchmark the effectiveness of the NEWS – is it length of stay in hospital, in-hospital mortality, or other outcome measures? We also recognise that the clinical outcome for individual patients will be affected by many factors, including: the timeliness of clinical response, the competency of responders, the nature of response, the clinical environment for ongoing acute care and the quality of training of all staff engaged in the assessment of acute illness. What is clear is that the design of future research should be greatly assisted by having a standardised approach supported by national data collection recording acute-illness severity according to the NEWS and subsequent clinical outcomes. This in turn would provide the substrate for further research to evaluate the cost and effectiveness of a wide range of new clinical interventions designed to improve the outcomes of patients with acute illness.

We recommend that future research be directed towards evaluating the efficiency of the NEWS in improving clinical-response times and clinical outcomes in patients with acute illness.

8 Ongoing review process for the NEWS

As with all guideline documents, a scheduled review cycle is necessary. The RCP is scheduled to undertake a review of this document in 2015 and sooner if deemed necessary. The NEWSDIG recognised that there is likely to be considerable and important feedback on the performance of NEWS and its wider impact. The NEWSDIG will work with the Clinical Effectiveness and Evaluation Unit at the RCP to explore the options for ongoing monitoring and evaluation of NEWS, and a formal assessment of its effectiveness.

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Appendix A

Stakeholders consulted in the development of NEWS

Academy of Medical Royal Colleges
British Thoracic Society
Intensive Care National Audit and Research Centre
The King's Fund
London Programme for IT
Professor the Lord Darzi, Parliamentary under secretary of state, Department of Health (June 2007–July 2009)
National Patient Safety Agency
National Confidential Enquiry into Patient Outcome and Death
National Institute for Health and Clinical Excellence
Royal College of Nursing
Society for Acute Medicine
National Outreach Forum
Resuscitation Council (UK)
Intensive Care Society
London Ambulance Service

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