Title: Early Warning Scores: A Sign of Deterioration in Patients and Systems.

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Abstract:
        The early warning score is a decision-making tool that has a simple design, yet its implementation in healthcare organisations is proving complex. This article reports the results of a survey that evaluated the nurses' experiences of using the NEWS (National Early Warning Score) in an acute hospital in Ireland. Staff reported that the NEWS was easy to use, did not increase workload and enhanced their ability to identify deteriorating patients. However, they also identified problems related to doctors' delayed response times, doctors lack of training in the use of the tool, and a failure by doctors to modify parameters for patients with chronic conditions. NEWS enhances nurses' role in early detection of patient deterioration but delays in response times by doctors, exposes systematic flaws in healthcare. This suggests that it is not only an indicator of patient deterioration but also of deteriorating healthcare systems.

Keywords:
Early Warning Score; decision making; implementation; evaluation; healthcare systems; training

Introduction

The National Early Warning Score (NEWS) system is used for the adult patient population in the Republic of Ireland. It was introduced in 2011 in response to a policy initiative and patient safety programme from the Health Service Executive (HSE) (Health Service Executive 2011a). Other early warning scores are in place specifically for the obstetric population. The purpose of early warning score systems is to ensure early identification and response to the deteriorating patient, and ultimately to improve patient safety.

Although this new national system has been adopted by health services internationally, it is important to evaluate it in a hospital context to identify changes that might be required to optimise performance. The national policy executive in Ireland recommends audit and evaluation of NEWS to ensure further development and successful implementation (National Clinical Effectiveness Committee (NCEC) 2013).

This article reports results of an evaluation of the NEWS system from the nurses' perspectives, focusing on its strengths and limitations in clinical practice, so that problems and potential solutions can be identified.

Background

The importance of early detection of patient deterioration, and activating a medical response in acute hospitals, has prompted health services in Canada, Australia and the UK to implement early warning score systems. Although there are many types of such systems, they share a common function as a bedside tool to assess basic physiological parameters and to identify patients 'at risk' or critically ill with associated escalation and medical team activation protocols (Patterson et al 2011).

Early warning scoring systems are simple in design, yet several studies reveal problems such as staff failure to recognise deteriorating patients or delayed response to them, which suggest that implementation of these tools in hospital can highlight shortcomings in healthcare delivery (Bagshaw et al 2010, Bucknell et al 2013, Donohue and Endacott 2010, Smith 2012).

Research into the use of early warning score systems has identified a variety of factors that influence the degree to which they can be implemented successfully (Bucknall et al 2013, Niegsch et al 2013, Patterson et al 2011). In the UK for example, Patterson et al (2011) suggest that problems stem from the absence of a standardised national early warning score system that provides an observation chart, staff training programme and review mechanism. Other authors suggest that the problems are staff-related, for example that ward nurses lack confidence in calling for help whenever they think patients are unwell but cannot provide quantifiable information, and therefore are reluctant to activate medical teams (Bucknall et al 2013, Jones et al 2006, Niegsch et al 2013).

Despite considerable research into the validity and reliability of the early warning score, there is a need for more studies that consider issues relating to implementation, or how to make the NEWS successful in acute hospitals (Kyriacos et al 2011). The introduction of new systems into healthcare organisations is complex; Etherington (2014) argues that strategies to improve the implementation of early warning score systems need to take a 'whole-system' approach, ensuring that all professional groups take ownership for making the system work in their hospitals.

Nurses play a central role in implementing an early warning score system and it is important to capture their 'voice' when evaluating the effectiveness of the tool. The evaluation reported here, which followed implementation of NEWS in Ireland, is timely and contributes to the review mechanism that will inform further development. The aim of this

study was to evaluate nurses' experiences of using NEWS in an acute hospital, and was aimed at identifying its effects on clinical decision making and highlight any problems with using the new system in clinical practice.

Survey. Trinity College Dublin and the regional HSE granted ethical approval for the study. Written permission to use Green and Allison's (2006) questionnaire was obtained. A regional acute 285-bed hospital which had completed implementation of the NEWS system, was used as the study site. The national guidelines and framework (HSE, 2011a), the standard NEWS documentation with a care escalation protocol and the Identify Situation Background Assessment Recommendation (ISBAR) communication tool had been put in place throughout all clinical areas. Also, a formal education programme called the COMPASS© Programme (Health Service Executive 2011b), on how to use the new NEWS system had been provided.

The COMPASS© Education Programme was modified to suit the Irish healthcare system and covered key topics including categorisation of patients' severity of illness, early detection of patient deterioration, use of ISBAR tool, triggers points that should prompt early medical review and use of the escalation plan (Health Service Executive 2011b). To complete the COMPASS© Programme, healthcare professionals were required to work through the COMPASS© Training Manual and CD independently, complete a multiple choice question paper and attend a mandatory face-to-face training session with the COMPASS co-ordinator.

Method. The survey was designed to evaluate the nurses' experiences of using NEWS with regard to its effect on clinical decision-making and to help identify problems with using the new system in clinical practice. The survey was based on Green and Allison's (2006)

validated self-report questionnaire and included demographic questions, Likert-scale questions on participants' experiences of using NEWS, and open comment sections. Responses were analysed using the Statistical Package for Social Sciences, which can perform highly complex manipulation and analysis of data. A content analysis was conducted on open-ended questions, and key phrases were grouped into topics to provide a descriptive summary.

Survey sample. All registered staff nurses working in one regional acute hospital who had used the NEWS system at least once (n=140) were invited to participate. Nurses in critical care areas such as intensive care, high dependency or accident & emergency were excluded as patients were monitored continuously in these parts of the hospital. Nurses in out-patient departments were also excluded because patients' vital signs were not routinely monitored in this area.

Findings.

Seventy-four staff nurses (53% response rate) with experience of using NEWS across surgical and medical wards responded to the survey, 68% of whom had ten or more years' experience in nursing, only 4% were newly qualified, with less than one year's experience. A training course on how to use NEWS had been provided as part of the implementation programme and most participants (88%) had completed this.

Effect on clinical decision-making.

When asked about the effect of NEWS on clinical decision-making, most participants (95%) said it gave clear instructions on actions required in response to the patient's score

triggers, and 70% agreed that it supported their decisions on whether to call a doctor to review a patient's condition (Table 1).

Table 1 Nurses' views on using the NEWS in clinical practice (n= 74)

	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
NEWS gives me clear instructions on what to do should a patient trigger.	29%	66%	1%	4%	0%
NEWS helps me make decisions whether or not to call doctor to review patient.	18%	52%	5%	21%	4%
Using the NEWS only makes extra work for me.	4%	13%	15%	55%	13%
NEWS allows me to better prioritise my care.	8%	46%	7%	34%	5%
NEWS takes away my clinical judgment skills	8%	14%	9%	46%	23%
Using the escalation criteria, I get a better response from the doctors	3%	24%	15%	35%	23%
When I inform the doctors using the NEWS, they review the patient within the time frame.	1%	10%	4%	60%	25%
Since introduction of NEWS, the number of times I have to call the doctor has increased.	25%	44%	7%	24%	0%
NEWS supports my gut feeling about an unstable patient	8%	42%	17%	28%	5%

Participants found that NEWS helped them identify patients who needed to be monitored more closely and they considered that it was a useful decision-making tool for newly qualified and student nurses. They found the tool helpful but in some cases, for example in patients with hypertension and acute myocardial infarction, they also used their clinical judgment to activate a medical review and did not rely solely on NEWS (Table 2).

Table 2. Patient cases where nurses used their own clinical judgment to call doctor

Survey Code	Patient cases where nurses used their own clinical judgment to call doctor
002	Increased BP (blood pressure)
006	Increased BP needing medical review
016	The patient's BP was 240/120
017	My experience helped me recognise the change in the patient's condition. There was no score on the NEWS even with an increased BP.
026	BP of 165/120 didn't trigger any score
036	If the patient is very hypertensive but will score 0 on the NEWS.
040	BP very high.
047	BP parameters need revising
055	Increased BP
059	Patients having an acute MI often none of their vitals were outside of the normal limits.
065	In the case of AMI (acute myocardial infarction) patients. They often have a NEWS of zero.

Perceived delays in doctors' response times.

When asked about their experience of response times, 85% of participants considered that doctors did not review patients within the recommended guidelines. They perceived the doctor's workload and lack of awareness of their NEWS role were two important factors that contributed to the delayed response times (Table 3). Participants noted that delays in medical team responses occurred when the medical staffing levels were low, for example out-of-hours, at night and during busy periods.

The second factor that nurses attributed to delayed response times was a lack of awareness of NEWS among some doctors. It appeared that some doctors were unaware of the significance of the score's trigger or the escalation procedure for response times, and when to contact the registrar and consultant. The participants attributed these problems to a lack of training, although data on NEWS training of medical staff were not included in this survey.

Table 3. Staff nurses' perceptions of medical response to activation calls

Survey Code	Staff nurses' perceptions of medical response to activation calls
007	There is a poor response from doctors.
010	If the doctor is busy then they can't review the patient in time.
011	Team don't always review in the requested time frame
012	The response time is improving but still not as per NEWS
026	The timeframe is not achieved in fact non-existent. It's only unless the patients scores really high or if they get reviewed by the [registrar].
032	The doctors don't always arrive on time when the NEWS is increased.
	Suggested reasons for perceived delay in doctor response time- Doctor's workload
027	It's not always possible for the doctors to review in time due to their workload especially in the out-of-hours times or with the reduced staff levels.
035	It depends on how busy they are.
045	In the evening some of the doctors are slower to respond. They are probably too busy.
047	Very dependent on time of day. Night shift gets a poor response as cover is low.
	Suggested reasons for perceived delay in doctor response time - lack of training
013	Doctor still wants to know what the vitals are. They don't understand when the NEWS is greater than 3.
018	Doctors don't know what the NEWS is. It takes them the same time to respond regardless of the NEWS score.
027	Doctors are not aware of the system.
031	I find it difficult to support this system because the doctors are not on board with it.
039	If doctors have been educated on the NEWS then why do I always have to explain everything to them?

Reluctance to modify parameters for patients with chronic conditions.

When asked for 'any other comments', participants frequently reported that doctors were reluctant to modify the NEWS parameters for patients with chronic conditions such as chronic obstructive airways disease (COPD) (Table 4). The result was that patients with COPD continued to trigger if they

had a high NEWS despite showing no other signs of clinical deterioration, which led to over-reporting and 'false' triggers of the medical team.

Table 4. Problems with modifying NEWS parameters for patients with chronic conditions

Survey Code	Problems with modifying NEWS parameters for patients with chronic conditions
006	Doctors are slow to document parameters. Doctors below (registrar) reluctant to document vital parameters.
010	In cases of COPD patient the NEWS kept triggering as he was on 0^2 but this was his normal base line.
014	NEWS put the responsibility on the nurse to call for help. However the doctors don't write acceptable parameters at the back of the sheet. So we have to keep calling every time the patient triggers.
017	Doctors are not documenting parameters.
019	Doctors are not documenting the acceptable NEWS score in cases of COPD. Then the patient scores a 3 if SPO^2 88%. This increases the amount of times we call the doctors
026	Doctors not charting parameters.
047	Doctor needs to chart parameters in the case of patients with COPD
048	It's impossible to get doctors to chart acceptable parameters.
054	Patient's on long term 0^2 often score a 3 but no acceptable parameters are charted.
069	COPD patient with score of 3 needs to be revisited

Discussion

This research study has several limitations. Only information from medical-surgical nurses was collected and other members of the multi-disciplinary team were not included. The focus was nurses' experiences of using NEWS and no attempt was made to audit patient records or measure actual response to patient times. Therefore, the findings must be interpreted as the participants' perspectives and it must be acknowledged that other healthcare team members may have different views.

The findings provide information about the strengths and limitations of NEWS based on the perspectives of nurses who use it in everyday clinical practice. As a decision-making tool, the medical-surgical nurse participants considered NEWS useful in helping them to

decide whether to call a doctor to review a patient's condition. Cox et al (2006) reported that nurses' caring for critically ill patients in general ward settings often lack confidence in knowing when to call for medical help. Although the nurses in this study were highly experienced, they valued NEWS as a tool to help them prioritise patient care and recommended it as a decision-making tool for newly qualified nurses and students.

While NEWS was considered to enhance the nurse's role in clinical decision-making, participants used it to supplement rather than replace clinical judgment. As experienced nurses, they know that NEWS has limitations and that it is unreliable in potentially serious situations, for example when patients are hypertensive or have an acute myocardial infarction. Conversely, participants also know that it can trigger 'false' positives in patients with COPD.

The introduction of any new patient safety initiative, including an early warning score, is supported by clear national policy and guidelines, staff education programmes and standardised documentation for recording the patient's vital signs (Patterson et al 2011). However, successful and full implementation of early warning systems in clinical practice depends on an appropriate response structure and having medical staff available to respond to activation calls.

Initiatives such as Hospital-at-Night in the UK, have been piloted to determine if the provision of out-of-hours medical cover by a centralised multidisciplinary team improves response times and patient outcomes (Beckett et al 2009). An important feature of the Hospital-at-Night team is the introduction of medical registrars, senior grade doctors and independent nurse practitioners instead of relying on junior grade doctors. Initial results indicate that although the overall time to review is no quicker, there are fewer adverse patient outcomes, which is attributed to senior clinicians deciding on patient management and on appropriateness for escalation of care.

Use of communications technology to enhance transfer of patient information between healthcare professionals and escalation is another way of improving implementation of early warning score systems (Johnston et al 2014, Georgaka et al 2012). Initial findings from a study comparing paper-based and electronic-early warning scorecards (O'Donoghue et al 2011) suggest that e-EWS (electronic early warning scorecard) can greatly improve data quality.

As these initiatives suggest, successful implementation of NEWS in healthcare organisations is complex and requires ongoing evaluation and development to resolve significant problems such as under-resourced response teams and slower paper-based communication systems.

Conclusion

Evaluations following implementation of early warning score systems are important to help identify problems and viable ways to address them. Finding solutions within limited healthcare budgets, for example to resource appropriate medical-nursing response teams and communication technology is challenging and may require a phased development plan that is tailored according to the needs of the individual healthcare organisation.

Interdisciplinary education programmes will ensure that nurses and doctors understand their own and each other's roles in using NEWS. However, healthcare managers also need to ensure that training programmes are ongoing so that, as new doctors and nurses continue to rotate through different healthcare areas, they learn how to use the NEWS system effectively.

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