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Abstract

Aims and objectives

This study aimed to describe how nurses use the Early Warning Score (EWS) in an acute medical ward, their compliance with the EWS and explore their views and experiences of the EWS.

Background

EWS systems have been implemented in response to upward trends in mortality rates. Nurses play a central role in the use of EWS systems. However, barriers to their use have been identified and include behavioural, cultural and organisational approaches to adherence. Improvement strategies including education and training and electronic devices have assisted in compliance with the system.

Design

A holistic single descriptive case study design was used.

Methods

Data triangulation was used including non-participant observation, semi-structured interviews with nurses and document analysis. Nurses were observed using EWS and were subsequently interviewed. Data analysis was guided by systematic text condensation (STC), an approach underpinned by Giorgi's phenomenological method, where meaning units and themes are identified. The study adhered to the consolidated criteria for reporting qualitative research (COREQ) guidelines

Results

Three themes with associated meaning units were found. *Protocol Adherence Vs Clinical Judgement* addresses nurses' knowledge, skill and experience and patient assessment. *Parameter Adjustment and Escalation* included parameters not being adjusted or reviewed, junior doctors not being authorised to set parameters and escalation. The final theme *Culture* highlighted a task driven approach and deficient communication processes.

Conclusion

This study highlights the need for ongoing training, behavioural change and a cultural shift by health care professionals and organisations to ensure adherence with EWS escalation protocols.

Relevance to Clinical Practice

Improvements in education and training into recognition, management and communication of a deteriorating patient is required. Also, a cultural shift is needed to improve compliance and adherence with EWS practice. The potential use of electronic data should be explored.

Key words: acute care; case study; deteriorating patient; early warning score.

What does this paper contribute to the wider global community?

- Identifies the factors that influence nurses' assessment of patients and their compliance and adherence with EWS practice.
- Provides an understanding of the need for continuing education and training on EWS practice involving collaboration between all health professionals to ensure that EWS systems are utilised effectively in responses to deteriorating patients.
- Highlights that organisational culture can result in a task driven approach to EWS practice and may influence early recognition and management of the deteriorating patient and their outcomes.

Introduction

In order to improve patient outcomes, health care professionals need to promptly recognise and respond to the acutely ill deteriorating patient. To assist with this, early warning score (EWS) systems were introduced in health services across Europe, Australia and America (Royal College of Physicians, 2017). The EWS utilises a standardised 'track and trigger' system to categorise the severity of a patient's illness, which can prompt nursing staff to request medical review at specific scores by using a structured communication tool and a definitive escalation plan (National Clinical Effectiveness Committee, 2013). Early recognition leads to a greater response and prompt management of the patient resulting in improved patient outcomes and increased patient safety (Bunkenborg *et al.*, 2014; Moon *et al.*, 2011; Smith *et al.*, 2013).

A national EWS to ensure standardisation across all hospitals has been introduced in Ireland. However, internationally, adaptations to the EWS system are evident, with certain variations in the escalation protocol and scoring systems depending on national and local requirements and clinical needs. Specifically, Ireland and Australia utilise EWS systems based on VitalPac EWS (ViEWS) compared to the United Kingdom's recommended NEWS (Smith *et al.*, 2015). Differences between the two variations can be found in the scoring of some parameters, for example, United Kingdom's NEWS scores a patient's oxygen requirements as a 2 whereas the ViEWS, used by Ireland and Australia, scores it as a 3. In addition, further modifications in EWS for patients with chronic respiratory disease is evident in some countries. In Denmark, the Capital Region of Denmark NEWS overrides the system (CROS), allowing doctors to set acceptable chronic values to the NEWS of a chronic respiratory patient, that is, setting an acceptable value range of 90% for oxygen saturations which has assisted in decreasing the false alerts caused by NEWS in these groups (Pedersen *et al.*, 2017). Nonetheless, although there have been many modifications made to the EWS internationally, the primary objective remains consistent, this being to recognise the early deteriorating patient. Nurses play a fundamental role in the EWS system and recognising a deteriorating patient. However, the practice of EWS relies on multidisciplinary involvement supported by organisational structures and protocols.

Background

The EWS system has been reported to reduce lengths of stays, cardiac arrests and mortality rates (Bunkenborg *et al.*, 2014; Moon *et al.*, 2011; Peterson *et al.*, 2016), and nurses have acknowledged that it enhances their ability to recognise the deteriorating patient (Fox and Elliott, 2015; McDonnell *et al.*, 2013; Salt, 2013). However, studies demonstrate that nurses lack knowledge and skill in recognising the deterioration of a patient (Cooper *et al.*, 2010; Hart *et al.*, 2014), and nurses' decision making contrasts to EWS protocols (Cooper *et al.*, 2013; Endacott *et al.*, 2015; Hart *et al.*, 2016; McGaughey *et al.*, 2017).

Compliance and adherence to EWS is influenced by many factors, including nurses' intuition, doctors' response times, team collaboration, communication and ward environments (Dalton *et al.*, 2018; Odell, 2015; Petersen *et al.*, 2017; Smith and Aitken, 2016). Moreover, weekends and nights have been identified as periods of non-adherence in recording the EWS due to reduced staffing levels and nurses not wishing to disturb sleeping patients (Gordon and Beckett, 2011; Hands *et al.*, 2013).

Developments in education and training utilising both simulation training, teamwork and communication methods have been found to be beneficial for nurses and have a positive impact on EWS practice (Connell *et al.*, 2016; Liaw *et al.*, 2016; Ludikhuizen *et al.*, 2011). In addition, the introduction of electronic systems that alert the critical care team from the patient's score has been shown to assist in improving response times and early patient management (Bellomo *et al.* 2012).

Many studies have directly examined compliance of the EWS through various methods including staff questionnaires (Fox and Elliott, 2015), examination of EWS factors affecting response (Kolic *et al.*, 2015) and mixed methods to explore health professionals' perceptions of a track and trigger system (Lydon *et al.*, 2016). However, there is limited reporting on how nurses use the EWS in their practice (McGaughey *et al.*, 2017).

Methods

Research Design

This study aimed to describe how nurses use the Early Warning Score (EWS) in an acute medical ward and explore their views and experiences of the EWS. The study also aimed to explore compliance with the recommendations outlined in the NCEC (2013) National Clinical Guideline on the National Early Warning Score. The study adhered to the consolidated criteria for reporting qualitative research (COREQ) guidelines (See Supplementary File 1).

A holistic single descriptive case study design was adopted and enabled exploration of specifics related to EWS from multiple perspectives to describe its practice in detail (Simons, 2009). Case study design allowed exploration of views and experience of using the EWS (through interviewing) and examination of compliance with the recommendations from the NCEC (2013) National Clinical Guideline on EWS (through observation and document analysis). A significant aspect of the case study design is that it seeks to ask the “how” and “why” a phenomenon occurs, over an extended period, as opposed to the other qualitative approaches that seek the “what” (Polit and Beck, 2012).

The unit of analysis was an acute medical short stay ward with 15 beds in a large regional hospital. The agreed protocol for patient stay in the short stay unit is 48-72 hours and patients are hence at the acute phase of their illness with greater risk of deterioration. Ethical approval was granted by the Regional Ethics Committee prior to undertaking the study (reference: 081117CF). An information leaflet outlining details of the study was placed on the ward notice board two weeks prior to the start of the study and each nurse and Health Care Assistant (HCA) working on the ward received written information about the study. HCAs were included in this study because their role in the unit includes assisting and supporting nursing staff in the delivery of nursing care, which involves assisting with hygiene needs and completing patients' EWS. Nurses and HCAs were invited to contact the first author by phone or email if they wished to participate in the study.

Consent forms were completed by all nurses and HCAs before non-participant observation and by all nurses before they were interviewed. HCAs were not invited

for interview as they are not responsible, nor do they complete any actions or interventions based on a patient's EWS.

From a total ward staff of 12 nurses and 2 HCAs, 9 nurses and 2 HCAs contacted the researcher expressing their willingness to participate in the study. Of these, 2 HCAs were observed, and 7 nurses were both observed and interviewed. One nurse was interviewed but not observed. Two nurses were observed but did not wish to be interviewed.

Data Collection

Case study requires several different data sources to provide a holistic view and encourages the mixed methods approach of both qualitative and quantitative data, therefore three data collection sources were utilised; i.e. non-participant observation of nurses and HCAs, semi-structured interviews with eight nurses and document analysis (patients' EWS charts, their medical and nursing notes and the NCEC (2013) Clinical Guideline on EWS).

Non-participant Observation

Consenting nurses and HCAs were observed by the first author as they assessed and recorded patients' vital signs on the EWS chart. A total of fifteen observations time periods took place on five different days and on different times, i.e. in the morning (on five occasions), afternoon (on five occasions) and at night (on five occasions). Unstructured observations lasted from 1 hour to 1.75 hours depending on the interventions completed by the nurse. Throughout the observation period, field notes and reflection pieces were recorded and later transcribed onto a Microsoft Excel sheet.

Semi-structured Interviews

Shortly after observation, the first author interviewed nurses (n=8) (with clinical experience ranging 5 to 22 years) using an interview schedule. Interviews lasted between 8 and 15 minutes. The questions were open ended and explored nurses' experiences and views of the EWS. The interview questions asked were based on items addressed in the National Clinical Guideline (NCEC, 2013) and from the

findings of previous literature identifying barriers and factors to EWS practice (Petersen *et al.*, 2017; Smith & Aitken, 2015). Examples of questions included, 'What do you see as your role with the EWS?'; 'Tell me about how you use the EWS?'. Additional specific questions were guided by the observational data recorded in the field notes, for instance, 'I noticed that the patient had a EWS score of 3 and you decided not to escalate care. What made you come to that decision?'

All interviews were audio-recorded and transcribed verbatim

Document Analysis

The documents reviewed during analysis included the patients' EWS charts, clinical and nursing notes, and the National Clinical Effectiveness Committee (NCEC, 2013) guideline recommendations on the EWS. The patients' EWS charts and clinical and nursing notes were reviewed immediately following each period of observation and notes added to the observation records. The NCEC guideline was examined to evaluate if the recommended processes were adhered to in practice.

Data Analysis

Data analysis was initially undertaken by the first author guided by systematic text condensation (STC) (Malterud, 2012). STC is a four-step approach to analysis that is heavily influenced by Giorgi's four step phenomenological method (2009). The phenomenological attitude adopted in STC allows for the essence of the phenomenon to be revealed freely with an open mind and for it to be described as accurately as possible (Malterud, 2012).

Using STC, the interview and observation data collected were firstly read to gain an overall impression of the meaning. Units of meaning were then identified that focused on EWS practice. Each meaning was collated together and those relevant to the phenomenon were considered. The units of meaning were then reviewed by both authors in the context of the documents reviewed. Following discussion, the overall meaning units were synthesised into relevant themes incorporating all three data collection methods allowing for the essence and descriptive variations of the phenomenon.

Results

The analysis of the data identified three themes as follows: 'Protocol adherence vs clinical judgement', 'parameter adjustment and escalation' and 'culture'.

Protocol Adherence Vs Clinical Judgement

It was observed that nurses would utilise the EWS on each patient assessment. On questioning, nurses valued the EWS and considered it important when assessing the deteriorating patient. However, nurses would often hesitate in decision-making when their intuition or knowledge conflicted with the EWS escalation protocol.

Patient assessment was regularly prompted by nurses' intuition or concern based on their 'knowing' the patient; *"...you know better.... knowing what they were able/capable of doing that day."* (Nurse B). Other comments included: *"Did you ever just have a feeling?"* (Nurse A), and *"I knew by looking at him that he wasn't right"*. (Nurse C).

Nurses highlighted that patient confusion was a significant factor in raising their concerns.

"..if a patient is confused you are thinking 'what is wrong with them?'... you would go and do the EWS". (Nurse E).

However, confusion would not necessarily be reported immediately and nurses relied on their clinical judgement and a patient's EWS when determining the escalation. Consequently, if a nurse deemed that a medical review was warranted, care was escalated. In contrast, if nurses had no concerns but the EWS activated the protocol, nurses' knowledge, skill and experience were utilised.

"...I mean if someone is only showing slight deterioration- scoring a 4-5 but there is nothing noticeable, bloods are fine, not chesty or showing signs of any deterioration, the doctors would only say "observe". I mean as a nurse you would know to observe, you would be keeping an eye on the patient." (Nurse D)

"Nurses don't go with everything on the protocol they do use their knowledge and experience." (Nurse E)

The escalation protocol was considered rigid because it did not allow nurses *"use [their] scope"* (Nurse A). Nurses were also critical of the absence of clinical judgement in decisions to deescalate care;

“I am a very experienced nurse and will know when to escalate care, why can’t my expertise and experience be part of it?” (Nurse C)

In situations where the EWS triggered the need for medical review, nurses would delay contacting doctors and deliver appropriate care based on their knowledge and skills. For instance, they would administer prescribed medication, oxygen, or advise patients to rest and increase their fluid intake in response to the patient’s individual parameters and scores.

“..the nurse feels that they [patient] do not warrant a review..... She may decide to complete an intervention herself- like give paracetamol to reduce the temperature or give prescribed oxygen for low sats. Then review in half an hour. You don’t want to be calling doctors to patients that need an intervention that the nurse can do.” (Nurse C)

Parameter Adjustment and Escalation

According to the EWS protocol, senior medical personnel, i.e., registrars and consultants only, are permitted to set parameter adjustments. However, nurses highlighted challenges with this.

“SHOs do not set parameters yet they are the ones reviewing the patient....you ring the Reg to review the patient as per the protocol and they will say ‘get the SHO’ to review.” (Nurse F)

It was observed that consultants and registrars rarely adjusted parameters and it only occurred following nurses’ requests.

One common parameter observed and also mentioned in interviews, was oxygen adjustment for patients with chronic lung disease. In the medical notes, doctors would document that the patient required oxygen, but this was rarely documented on the EWS chart. Patients with chronic lung disease require home oxygen, however, they rarely had their parameters adjusted on admission;

“The COPD patients with low sats and on oxygen never have parameters set when they come from ED.” (Nurse G)

“Patients could be on O2 at home, yet parameter may not be set, and we have to get them reviewed...It would be great if nurses could have more authority with parameters, if we could set a parameter for oxygen.” (Nurse E)

When parameter adjustments were set, they were rarely reviewed and no deactivation of parameters was observed. For instance, one patient observed on admission had adjusted parameters set for blood pressure, oxygen saturations and

temperature. The patient responded well to treatment and was due for discharge when she deteriorated. However, the patient's parameter adjustments were still valid, so the nurses did not escalate her care as promptly as required.

Clinical responses were often delayed due to workload pressures. Doctors would frequently communicate advice and orders over the phone and would review the patient later when they had prioritised their own workload.

"Some doctors are better than others for reviewing immediately, others you have to chase and chase." (Nurse D)

"You are often ringing and ringing them to come up.... The other day I spent an hour trying to get a doctor to review a patient because of their EWS." (Nurse G)

Some patients were not reviewed following escalation and nurses would frequently only contact the doctor again if the patient's score had increased. For instance, one patient was observed to have an EWS of 5 with a BP of 67/39, saturations 94% on room air and had no adjusted parameters set. The nurse discussed the patient with the attending SHO who explained that the patient's low BP was due to a poor cardiac ejection fraction, and advised that the patient should receive oxygen. The patient was not medically reviewed, parameters were not adjusted and there was no management plan documented. This interaction between the nurse and doctor was observed to influence the nurse's response when she repeated the EWS. She did not contact the doctor again but discussed the patient's EWS with another nurse to seek an opinion.

Culture

During interviews, nurses often described the EWS as a task rather than a tool that assists in recognising the deteriorating patient. This view is evident in nurses' responses to being asked about their role with the EWS:

"I would do vital signs on my patient and record them on the chart". (Nurse G)

"To complete it and check if any parameters set. Tally up the scores and see if you need to call a doctor." (Nurse E)

"We record it and then we feedback to the medical teams what a EWS is." (Nurse A)

The EWS was completed at set times on the ward. It was observed that vital signs were monitored on the day shift- at approximately 10.00 and 16.00 and on the night

shift- at approximately 22.00 and 06.00. These times appeared to have evolved as common practice on the ward. Patients who scored highly or activated a concern had the EWS completed in-between the designated times. It was evident that the frequency of observations/minimum observations was not documented in the medical or nursing notes nor on the EWS chart. During interviews, most nurses did not refer to complying with this when completing the EWS, preferring to continue with the ward culture of set times. However, one nurse did refer to the minimum standard of completing the EWS 12 hourly when the score is 0 and disagreed with it;

“I think I would be saying to do it 6 hourly even if it’s a 0 as the minimum. Did you ever have someone well in the morning and then they are so sick come lunchtime?” (Nurse A)

Nurses described using the overall score to determine the patient’s condition and the tracing of each vital sign was not mentioned;

“You do use the score to rate how sick they are and what you need to do about it.” (Nurse G)

“If the score is higher than previous scores, there is something wrong.” (Nurse F)

Graphing observations was not evident on the charts and many nurses utilised different methods of recording the readings, i.e., inserting the number of the temperature reading instead of plotting it as a dot. Graphs of vital signs were not clear on the charts reviewed and each EWS chart. Moreover, each chart had to be examined very closely to detect evidence of early patient deterioration.

Nurses did highlight a patient’s EWS when communicating a deteriorating patient to medical staff. However, nurses were often prompted for more information by the doctor. ISBAR (identify, situation, background, assessment and recommendation) was seldom used as a communication framework. Nurses were aware of the ISBAR but generally did not use it.

“I ring the doctor and inform them of the score and what is wrong with the patient....I forget about it [using ISBAR].” (Nurse G)

“I don’t use ISBAR..... the first thing a lot [Doctors] will ask is ‘what is the EWS?’ ” (Nurse A)

However, one nurse did acknowledge that she attempts to use ISBAR but identified that;

“...when you are in a panic it is hard to remember it. I think the more we start using it, the more it will be embedded in our brain and it will become second nature.” (Nurse C)

Discussion

This case study has found that nurses' clinical judgement can conflict with the EWS escalation protocol. It is also reported here that the culture of non-adherence to protocol escalation, non-modification of parameters, and ineffective communication has resulted in a task driven approach to EWS practice. However, the finding that nurses' concern or intuition assisted them in detecting a deteriorating patient and completing the EWS may have been an influencing factor on the task driven approach. Nurses acknowledged that their knowing the patient prompted them to act on their intuition. Intuition or a “gut feeling” has been a common theme in recognising the deterioration of a patient (Coffi *et al.*, 2010; Dalton *et al.*, 2018; Donohue and Endacott, 2009; McDonnell *et al.*, 2012) and literature has suggested that nurses resist contacting doctors on intuition alone as they believe they must defend their assumptions (Dalton *et al.*, 2018; Massey, 2014). This study demonstrated that once nurses were concerned about a patient's condition or acute illness severity, they undertook a patient assessment by completing the EWS and escalated care utilising their own clinical judgement and were not reliant on the EWS protocol. NCEC (2013) outlines that the escalation protocol permits escalation of care based on concern alone regardless of abnormal physiological measurements.

However, there were cases where a patient's EWS was raised but nurses were not concerned about the patient and they did not escalate. In these cases, nurses relied on their own clinical judgement to manage the patient rather than comply with the escalation protocol. Nurses would utilise their knowledge and skill, i.e., administering prescribed medication, observing the patient, repeating the EWS and then reassessing to decide whether to refer the patient for medical review. This is in keeping with other studies who also report that nurses believed that their knowledge was adequate to manage the patient without an escalation of care to the medical team (McGaughey *et al.*, 2017; Odell, 2015; Petersen *et al.*, 2017; Shearer *et al.*, 2012). This approach to patient management is heavily reliant on nurses' knowledge and skill and McGaughey *et al.* (2017) highlighted in their study that in most cases, nurses' decisions to manage patients were appropriate but on occasion, a small

number of deteriorating patients were not recognised promptly enough. Evidence suggests that junior staff do not have the ability to recognise early deterioration indicators due to lack of experience (Johnston *et al.*, 2015; Ludikhuizen *et al.*, 2011). McGaughey *et al.* (2017) also identified that less experienced staff could not interpret findings due to insufficient clinical judgement. Although our study found no indication of this, it was noted that new onset patient confusion, an indicator for deterioration, was managed differently depending on nurses' experience and was not seen as an immediate escalation. Nurses would either escalate immediately for medical review or observe, complete the EWS and inform doctors on a later visit to the ward, which at times was more than 12 hours later. Confusion has only recently been recognised in the context of the deteriorating patient. In the UK, on review of the early warning score guideline, new onset confusion was added into the EWS as part of the AVPU (Alert, Voice, Pain, Unconsciousness) scale, now called ACVPU; the patient that has new onset confusion will immediately score an EWS of 3, which indicates that the patient requires urgent escalation and review (RCP, 2017).

Escalating care of a deteriorating patient is vital to ensure that treatment is promptly provided to improve patient outcomes. Response times were often delayed due to doctors' work demands. Also, patients were often reviewed by junior medical staff when a senior medical review was warranted. This seemingly lack of commitment from senior medical staff to respond to deteriorating patients is consistent with other research studies (Donohoe and Endacott, 2009; Fox and Elliott, 2015) and may result in delays in treatment. Patient outcomes could potentially be compromised and this could then lead to negligence and professional misconduct of both nurses and doctors for failure to respond and manage the patient's deteriorating condition.

A prominent finding was the challenges with parameter adjustment for patients with chronic lung disease. These patients have frequent hospital admissions and require parameter adjustments for oxygen therapy and oxygen saturations. However, parameter adjustments were only completed occasionally. On questioning at interview, nurses expressed the belief that their own knowledge could be applied to permit them to adjust these parameters. The UK Royal College of Physicians (2017) have acknowledged these challenges and introduced a separate SpO₂ section of the EWS chart dedicated for patients with confirmed hypercapnic respiratory failure which aims for a safe target range of SpO₂ between 88 and 92% on room air. This

prevents unnecessary scoring for this group of patients for having low saturations and requiring oxygen, and therefore avoids the administration of high flow oxygen. Administering high concentration oxygen to patients with COPD can increase the likelihood of mortality due to high levels of carbon dioxide in the blood (O'Driscoll *et al.*, 2017).

Other challenges associated with parameter adjustment found in this study include, adjusted parameters not being modified appropriately and not being reviewed once they were adjusted. This has arisen because senior medical personnel are only authorised to adjust parameters, as guided by the NCEC (2013). Senior House Officers (SHOs) frequently reviewed patients and were accessible to nurses. They also would frequently communicate recommendations to nurses in the management of patient care. Parameter adjustment by registrars and consultants was intermittently seen and was often only completed on request of the nurse. Similarly, Lydon *et al.* (2016) found a lack of engagement from senior doctors with the EWS and suggested the need for greater involvement and support. Once parameters had been adjusted, they were rarely reviewed. In this study during one period of observation, a patient's repeat deterioration was not escalated as promptly as it should have been as parameters had been adjusted on their admission and not reviewed. This lack of compliance and engagement by doctors allows nurses to feel custodians of the chart by default (Elliott *et al.*, 2017) and can lead to poor quality teamwork and lack of communication between nurses and doctors.

Ineffective communication with the EWS system was apparent in this study and has also been highlighted by others (Brier *et al.*, 2015; Martland *et al.*, 2016; McGaughey *et al.*, 2017; Shearer *et al.*, 2012). The ISBAR, a structured communication framework, is recommended for use when communicating the deteriorating patient (NCEC, 2013). During observation, this was not used when communicating a deteriorating patient and nurses only alluded to not utilising it when asked at interview, stating that they either forgot or chose not to use it. McGaughey *et al.* (2017) also identified that staff did not use the SBAR as they felt it was time consuming. This inadequate communication of the deteriorating patient can have a detrimental effect because doctors may not receive a comprehensive assessment of the patient and not understand the significance of the deterioration. Equally, it is important that the doctor effectively communicates their response to the nurse.

It was observed that one doctor's ineffective communication skills deterred a nurse in reporting the same patient to the doctor again. This nurse chose instead to validate her re-assessment with another nurse. Factors such as poor communication and lack of collaboration among health care professionals affect patient safety and are considered barriers in escalating patients' care (Braaten, 2015; Johnston *et al.*, 2015).

The observation findings suggest that EWS is task driven. The EWS was completed at set times on the ward and appeared to be of lower priority in comparison to other activities, including medication rounds and washing patients. The frequency of observations was not recorded or completed based on patients' scores. Alternatively, it was completed around certain times depending on staff availability and busy periods. Petersen *et al.* (2017) noted that this pattern was most evident during the night when staff did not wake patients to record their EWS. McGaughey *et al.* (2017) also found that staff did not record frequency of observations as they were unable to conform to the recording procedure as recommended by the EWS national guidelines. However, it was evident during periods of observation in our study, that compliance with the protocol on the frequency of recording in the EWS chart was very challenging for nurses due to increase in their clinical workload and sometimes inadequate staffing levels on the ward.

On examination of the EWS charts, graphs were not evident and numbers instead of dots were inserted. Therefore it was difficult to identify any trends or subtle changes with individual parameters. This has been a finding in other studies (Brier *et al.*, 2015; Elliott *et al.*, 2017) and could result in an omission in recognition and assessment of the early deteriorating patient and a delay in appropriate management.

During interviews, nurses seldom described the completion of the EWS as a method for patient assessment. In addition, when observed, the EWS did not appear to be used by nurses as a systematic method of patient assessment. Nurses viewed the EWS as a score for how sick a patient was and appeared reliant on patients' overall scores. Nurses often missed early signs of deterioration as individual parameter trends were not evaluated and interpreted together in order to detect any subtle adverse changes. McGaughey *et al.* (2017) also found that nurses used the overall

score rather than assessing the patient and did not complete an overall assessment to decide on the deterioration risks. It has been suggested that increased educational awareness is required to assist nurses in the recognition and management of the deteriorating patient (McGaughey *et al.*, 2017; Morris and Davies, 2010). Education and training on recognising the deteriorating patient, utilising the EWS and using a systematic approach for assessment should be incorporated into all acute settings (NCEC, 2013).

The EWS was first introduced five years ago in all Irish hospitals and the findings reported here suggest that health care professionals require an update as inadequate practices have become accepted culture. A recent systematic review suggests that educational programmes on EWS are effective in increasing nurses' knowledge and documentation of EWS, at least in short term (Saab *et al.*, 2017). However, the review also concludes that EWS updates require educational approaches that go beyond merely improving knowledge levels and should focus on outcome-based training (Saab *et al.*, 2017). The emphasis therefore of any update should be on developing experience and expertise rather than knowledge (Rattray *et al.*, 2010) and simulation training should be used (Connell *et al.*, 2016) as part of a team collaboration. Multidisciplinary focused education programmes have proven effective (Merriel *et al.*, 2015), and nurses welcome education in collaboration with doctors to develop teamwork and communication relationship (Petersen *et al.*, 2017).

This study has a number of limitations. Case study research is considered the 'seventh moment' of research, and promotes flexibility in terms of epistemology, ontology, methodology and the research approaches (Denzin and Lincoln, 2005). However, this flexibility it is often criticised for its lack of rigour and systematic approach (Cope, 2015). In addition, this was a single case study and the findings may have been different if the study examined multiple cases. However, the utilisation of data triangulation assisted in achieving a vivid representation of EWS practice on an acute medical ward. The study findings may have been affected by nurses knowingly being observed which may have influenced their behaviour and approach to the EWS. Furthermore, the study was conducted during a busy period in the hospital where increased capacity added to pressures and time demands on staff. Moreover, doctors' induction programme (including EWS), took place at the end of the study which may have influenced their approach to using the EWS.

Finally, the study just focused on nurses' practice and for this reason, doctors were not interviewed about their opinion and experience with the EWS which may have resulted in different findings.

Conclusion

This case study of EWS practice on an acute medical ward has revealed that nurses' clinical judgement can result in a deviant approach to EWS escalation protocols and that culture plays an important factor in EWS practice. An organisational approach is needed which incorporates collaboration of multidisciplinary team members in EWS education and training that includes the recognition of patient deterioration, systematic patient assessment, interpretation of findings and communication methods to escalate care in the management of a deteriorating patient. A behavioural shift is required to change health care professionals' approach to the EWS in regards to adherence of escalation protocols and the use of ISBAR as a communication method. Staffing levels and staffing mix within organisations must also be addressed to ensure senior involvement on the EWS. The recognition and management of a deteriorating patient requires ongoing training, behavioural change and a cultural shift to ensure the safe delivery of effective quality care.

Relevance to Clinical Practice

Organisational culture can influence adherence of EWS practice and a collaborative behavioural and organisational approach should be central to practice development strategies. The importance of communication and collaboration between team members in escalating care is fundamental to managing a deteriorating patient. Education and training play an important role in the recognition of the deteriorating patient and multidisciplinary simulation training should be offered. The potential implementation of an electronic data capture that automates the score, tracks and triggers deterioration and automatically alerts a medical emergency response team, should also be explored.

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