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Recognition of the Critically Ill, the Use of Early Warning Scores

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"Patients do not die of their disease. They die of the physiological abnormalities of their disease." Sir William Osler

Introduction

Recognition of the critically ill patient is of paramount importance and is often sub-optimal (Goldhill 2001; McQuillan et al. 1998). It is known that small changes in physiological parameters occur before marked clinical deterioration and inappropriate or delayed action in response to these changes can lead to increased mortality (Goldhill et al. 1999; McQuillan et al. 1998). The reality is that many patients are referred to critical care after they have suffered an 'unexpected' cardiac arrest and that deterioration in physiological parameters prearrest, although often noted, go untreated (Buist et al. 2002; Goldhill et al. 1999; Schein et al. 1990). To prevent this, a proactive rather than reactive approach is needed. This requires a co-ordinated team approach with timely interventions targeted to the patients' needs before catastrophic deterioration occurs (Buist et al. 2002; Goldhill 2001).

Generic physiological based 'early warning score' (EWS) systems have been developed to aid the recognition of the critically ill patient (Goldhill and McNarry 2004; Goldhill et al. 1999; Subbe et al. 2001). EWS systems are now commonly used in many settings ranging from emergency departments, acute admission units and theatre recovery suites to general medical and surgical wards.

What is an Early Warning Score?

An EWS is a simple, reproducible score, calculated at the bedside, to identify patients who are, or are at risk of becoming, critically ill. An EWS can be recorded by any staff member and provides a structured approach to the interpretation of simple bedside observations (Subbe et al. 2005). It incorporates a series of routinely recorded physiological measurements into a pre-defined scoring scheme (figure 1, p.22). Points are awarded for deviation away from the 'normal' range.

As changes in physiological parameters occur before clinical deterioration, at-risk patients can be identified from the EWS, allowing more opportunity for timely interventions (Paterson et al. 2006; Rivers et al. 2001; Subbe et al. 2003). The EWS also provides a simple means of tracking trends in physiological parameters before and after any given intervention, e.g. fluid bolus, oxygen administration. As such, they are also described as 'track and trigger' systems.

No scoring system is ideal for every clinical scenario. Since the original introduction of EWS systems, several modifications have been published although each contain the core bed-side observations of heart rate, blood pressure, respiratory rate, mental state and temperature. All follow the same principle of measuring physiological parameters and scoring them in relation to a reference 'normal'. For each parameter, the greater the physiological abnormality the greater is the score. The scores for each individual parameter are summated to give the overall EWS. The higher the EWS the greater the need for critical care admission or risk of death (Goldhill and McNarry 2004; Goldhill et al. 2005; Subbe et al. 2001). Surprisingly, age is not a standard variable recorded in all EWS systems, although the effect of adding an age threshold is a proven independent variable in predicting outcome (Goldhill and McNarry 2004; Subbe et al. 2001). Other variables could be added, however, a balance is needed between usability and complexity (Paterson et al. 2006).

The EWS should be recorded, ideally on the patient's observation chart. There should be clear instructions regarding the EWS triggers for escalating observations and requesting medical assessment (Table 1).

An accepted international EWS would be useful (Paterson et al. 2006), especially for staff rotating between hospitals. In the absence of a standardised EWS used in all hospitals, the individual scores and EWS thresholds must be clearly defined and readily accessible. There is a concern that mistakes could occur where subtle differences exist between different hospital EWS systems. Recently a standardised cardiac arrest number was introduced into all UK hospitals following similar concerns.

When to Calculate an EWS and What to do Next?

An EWS can be recorded on any patient at any time if any staff member is concerned about the patient's condition. For any given unit (e.g. an acute admission unit), it is easy to instigate a policy to record an EWS on patient admission. The first EWS can be used to determine the frequency of subsequent observations. This is especially appropriate for acute medical patients who are most likely to be critically ill at the time of admission (Subbe et al. 2001). Continued observations are necessary to identify a patient whose clinical state subsequently deteriorates. Early identification through an EWS may allow intervention before the patient becomes critically ill. The usefulness therefore of an EWS is dependent on the frequency of observations performed and the ability of ward staff to recognise the cardinal signs of a patient becoming unwell.

Recognition of a deteriorating or critically ill patient is only the initial step. The use of scoring systems encourages the ethos that any team member can alert senior/critical care staff that a patient is unwell (Ridley 2005). The EWS must be used with an organisational pathway. There is little point in recording an EWS if there are no clear instructions on what to do with that score. In general, a score greater than the hospital 'trigger' value should lead to a patient review by a member of the medical staff and increased observation frequency. The exact member of the medical team to be contacted and the time limit for this review should be determined by the individual hospital (Paterson et al. 2006). Staff education is very important. Staff must recognise the importance of the EWS, calculate it correctly and summon senior nursing and medical assistance appropriately.

Should this Medical Attention be From a Junior Doctor or a More Experienced Clinician?

In many circumstances, it is usually the most junior member of the team who is called to a deteriorating ward patient. As such, the system relies on the junior doctor's skills to recognise the severity of the situation and respond appropriately. In some institutions, EWS systems are used to triage patients. Those with a low EWS are seen by junior medical staff whilst those with higher scores are seen by more experienced staff. Where critically ill patients are seen by senior clinicians, it is important that junior staff are taught how to recognise and manage the critically ill.

Establishing an EWS System

Good education of all staff involved in patient care is paramount for the success of any EWS system as is the support of all senior staff. This requires an education programme, which includes every member of ward staff and every doctor, and stresses the importance of a team approach. It must give emphasis to the aims of the EWS system and the importance of quick and appropriate responses at all levels. In our institution, we provided designated members of the critical care nursing staff who visited all wards on a frequent basis and ensured all staff were appropriately trained in the use of the EWS system before its implementation. Nursing and medical staff from critical care also taught medical staff of all levels, both formally and informally, about the EWS system and response policy. An ongoing educational programme must exist to ensure all new staff are trained whilst re-emphasising the importance of the EWS system to existing staff members.

In many hospitals, the initial observations are performed by healthcare assistants (HCAs) and not qualified nursing staff. These HCAs must understand the importance of recording every physiological parameter of the EWS and calculating a total score. Early audits within our own hospital demonstrated that in many cases not all observations were performed, in particular the respiratory rate (known to be the most important of these parameters) was omitted and therefore an EWS could not be calculated. These HCAs must feel reassured that they can report any concerns to a senior member of staff. The senior nursing staff similarly must know the importance of the score and ensure that medical support is requested. The doctor must recognise the importance of the score, the need to assess and treat the patients promptly and the importance of seeking senior help. The escalation plan should also link into the outreach and critical care services in the hospital, so that the critically ill are referred appropriately. The system fails if any link in this chain fails.

Staff are often reluctant to request senior help and every opportunity for positive feedback should be taken. We have developed documentation on the reverse of the EWS chart to record every response. This stresses the importance of the action and enables audit. The EWS scores and responses should be audited regularly to re-emphasise the importance of responding appropriately. Any cases resulting in an adverse outcome should be reviewed and any learning points fed back. The use of an EWS within intensive care units is of limited value. In this environment, patients are continuously monitored and each physiological parameter considered separately with acceptable ranges defined for each patient.

Limitations

The limitations of EWS systems relate to their generality. The EWS uses physiological parameters independent of pre-existing chronic illness. This ensures they have a high specificity for identifying the critically ill patient, although low sensitivity (Subbe et al. 2005). As with all screening tests, the scoring system needs to be taken in the context of the patient's pre-existing health problems.

For example, consider a patient admitted via the acute medical admission unit. The patient is mentally alert, pulse 104bpm, BP 80/44mmHg, oxygen saturation 94% on room air, respiratory rate 18/min and temperature normal. The patient's EWS is four (figure 2). If this were a 76-year-old patient with a history of ischaemic heart disease with significant left ventricular systolic dysfunction and chronic airways disease, these observations may be acceptable. However, if the patient was a 19-year-old university student and a friend had been admitted in the previous 24 hours with suspected meningococcal septicaemia, these observations would be a cause for concern. The clinical context must clearly be taken into account.

The introduction of EWS systems has been shown to improve the recording of physiological variables. It remains to be seen if EWS systems significantly and consistently improve patient outcomes (McBride et al. 2005; Paterson et al. 2006; Priestley et al. 2004; Subbe et al. 2003).

Other Scoring Systems

Over the last decade other scoring systems have been introduced for a number of medical and surgical conditions. These scoring systems, unlike an EWS, are disease specific and are used to calculate an outcome related to that specific disease process. For example, validated scoring systems specific to patients with acute coronary syndromes (ACS) have been developed (e.g. TIMI risk score). These highlight the critically ill ACS patient and provide an estimation of the risk of death/reinfarction in the short and long term (Antman et al. 2000). Validated scoring systems have also been developed to predict the risk of death and re-bleeding in patients with acute upper gastrointestinal (GI) bleeding (e.g. Rockall score (Rockall et al. 1996)). Disease-specific scoring systems predict disease-specific outcomes and are usually only calculated once. Although some degree of overlap is unavoidable, they can and should be used together with an EWS. For example, sequential use of an EWS might alert a medical team to the possibility of a GI bleed, but once the diagnosis is established, the disease-specific scoring system may be more useful in aiding initial management. With most physiologically based EWS, the primary outcome is prediction of critical illness and the subsequent need for escalation of care. They are designed to alert staff of illness severity and need to be calculated repeatedly to identify deterioration (Ridley 2005). Combining the EWS with a diseasespecific score may enhance delivery of optimal care to the patient.

Conclusion

Changes in physiological parameters occur before clinically catastrophic deterioration. EWS systems are valuable tools for the early recognition of highrisk hospital in-patients. Their widespread use is to be encouraged so long as appropriate action is taken once an at-risk patient is identified. A clear escalation policy and staff education are required to ensure that these patients, when identified, receive appropriate management.

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