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Review article

Do either early warning systems or emergency response teams improve hospital patient survival? A systematic review☆

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ABSTRACT

Background: For critical care to be effective it must have a system in place to achieve optimal care for the deteriorating ward patient.
Objectives: To systematically review the available literature to assess whether either early warning systems or emergency response teams improve hospital survival. In the event of there being a lack of evidence regarding hospital survival, secondary outcome measures were considered (unplanned ICU admissions, ICU mortality, length of ICU stay, length of hospital stay, cardiac arrest rates).
Methods: The Ovid Medline, EMBASE, CINAHL, Web of Science, Cochrane library and NHS databases were searched in September 2012 along with non-catalogued resources for papers examining the effect of early warning systems or emergency response teams on hospital survival. Inclusion criteria were original clinical trials and comparative studies in adult inpatients that assessed either an early warning system or emergency response team against any of the predefined outcome measures. Exclusion criteria were previous systematic reviews, non-English abstracts and studies incorporating paediatric data. Studies were arranged in to sections focusing on the following interventions:

Early warning systems
- Single parameter systems
- Aggregate weighted scoring systems (AWSS)

Emergency response teams
- Medical emergency teams
- Multidisciplinary outreach services

In each section an appraisal of the level of evidence and a recommendation has been made using the SIGN grading system.
Results: 43 studies meeting the review criteria were identified and included for analysis. 2 studies assessed single parameter scoring systems and 4 addressed aggregate weighted scoring systems. A total of 20 studies examined medical emergency teams and 22 studies examined multidisciplinary outreach teams.
Limitations: The exclusion of non English studies and those including paediatric patients does limit the applicability of this review.
Conclusions: Much of the available evidence is of poor quality. It is clear that a 'whole system' approach should be adopted and that AWSS appear to be more effective than single parameter systems. The response to deterioration appears most effective when a clinician with critical care skills leads it. The need for service improvement differs between health care systems.

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1. Introduction

Critical care departments exist to care for the sickest patients within a hospital. Patients often have a prolonged period of physiological instability prior to admission to the intensive care unit (ICU)[1] and the earlier this can be identified, the better the overall outcome.[2] For an ICU to be effective therefore, it must have a system in place to achieve optimal care for the deteriorating ward patient. It has been proposed that such a 'rapid response' system must have an effective 'afferent limb' whereby there is early identification of prospective admissions, complemented by an equally appropriate 'efferent limb' with timely, effective clinical assessment of need for admission and treatment (Fig. 1).[3] Healthcare resources worldwide have been focused on identifying the best processes to form such a system, however solutions have been disparate and often unvalidated.

In Australia, patients are identified using single parameter or 'trigger' systems, which rely upon the periodic observation of selected physiological variables, that are compared to pre-defined set parameters.[4] Any single abnormal clinical observation parameter triggers the attendance of a clinician led medical emergency team (MET).

Within the UK, a different rapid response system has been developed.[5] Patient identification is based on the use of aggregate weighted scoring systems (AWSS). These systems allocate points to the level of derangement of each physiological parameter, and when the overall 'early warning' score rises above a preset level, a call out cascade is triggered. Within the UK this efferent limb response involves a combination of the patient's own medical team and a 'Critical care outreach team' (CCOT). CCOTs are multidisciplinary teams (MDTs) often led by senior critical care nursing staff with variable levels of physician support. In addition to reacting to AWSS triggers they also aim to prevent deterioration through a combination of proactive review of act-risk groups (such as patients recently discharged from critical care) as well as providing ongoing ward staff education.

Identification of critical illness has remained problematic[6,7] and this has recently led to a re-appraisal of both early warning systems and emergency response teams.[3,8,9] There is concern that single isolated abnormal physiological parameters are not sensitive enough to identify deterioration in a timely manner: it has been suggested that within an established MET system the most common trigger was the concern of "worried" ward staff rather than any physiological parameter.[10] The true impact of these potentially costly services on outcome measures such as patient survival, cardiac arrest and unplanned ICU admissions rates remain unclear[11–13] and recent published reviews[14–16] have highlighted the need for more evidence-based solutions that impact on patient outcomes or healthcare costs.

The review was designed to assess whether either early warning systems or emergency response teams improve hospital survival or unplanned ICU admissions, ICU mortality, length of ICU stay, length of hospital stay, cardiac arrest rates.

2. Objectives

The review aimed to answer the question: Do either early warning systems or emergency response teams improve inpatient hospital survival when compared with standard ward care? Secondary outcome measures of unplanned ICU admissions, ICU mortality, length of ICU and hospital stay and rates of cardiac arrest were also considered as part of the review.

3. Review method

The PICO (Population, Intervention, Comparison, Outcome) strategy was applied to help guide our search (Appendix 1). An information scientist was enlisted to assist with the search strategy. Two advanced Ovid Medline searches were undertaken on the 20th of September 2012. The first search targeted papers relevant to early warning systems and the second targeted emergency response teams. The results were limited to adult only clinical trials and comparative studies published in the English language between 1996 and February 2012 (Appendix 2). In addition the EMBASE, CINAHL and Cochrane databases including CENTRAL and DARE were searched using the same keywords. Using the previously determined outcome measure criteria for acceptability