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

McNeill G, Bryden D

CRD summary
The authors concluded that a whole system approach should be adopted and aggregate weighted scoring systems were more effective than single parameter systems. Much of the available evidence was poor quality. While the results presented reflected the available evidence, it was unclear how the firm recommendations had been derived from poor quality evidence, therefore these should be considered with caution.

Authors' objectives
To review the available literature and assess whether early warning systems or emergency response teams improve hospital survival.

Searching
Six databases were searched from 1996 to September 2012 including MEDLINE, EMBASE, Database of Abstracts of Reviews of Effects (DARE) and The Cochrane Library. English language papers were considered for inclusion. References and relevant websites were checked and experts contacted to identify further relevant papers. Search strategies were reported.

Study selection
Studies in adult inpatient populations which compared either early warning systems or emergency response teams with standard ward care and reported hospital survival were eligible for this review. Secondary outcomes of interest were unplanned intensive care unit admissions, intensive care unit mortality, length of intensive care unit stay, length of hospital stay and cardiac arrest rates.

All of the early warning systems studies were uncontrolled before and after designs. Emergency response team studies included observational, comparative cohort and randomised controlled trials. A large number of the medical emergency team studies were based in Australia. Very few population details were reported.

Study selection was performed by two reviewers and disagreements were resolved via discussion to reach consensus or referral to a third party.

Assessment of study quality
Checklists were devised for each study design type. Randomised controlled trials (RCTs) were assessed against 10 criteria with each rated as well covered, adequately addressed or poorly addressed. Observational and other studies were rated against 5 criteria. These results were then incorporated into evidence evaluation using the SIGN guidelines. It was unclear how many reviewers performed quality assessment. RCTs were rated as 1 and other study designs as 2, with an additional "++" if most aspects were well covered, "+" if most aspects were adequately covered and "-" if most aspects were poorly covered. It was unclear how many reviewers assessed study quality.

Data extraction
It was unclear how many reviewers extracted or checked the data.

Methods of synthesis
Included studies were grouped according to intervention: early warning systems (single parameter systems or aggregate weighted scoring systems), emergency response teams (medical emergency teams or multidisciplinary outreach services). For each grouping, the evidence was appraised and recommendations were made using the Scottish Intercollegiate Guidelines Network (SIGN) grading system.

Results of the review
It appeared that 48 studies were included in the review. Study participant numbers were not consistently reported.
where available they ranged from less than 100 to over 448,000 patients.

**Early Warning Systems (six studies):** Two studies evaluated single parameter early warning systems, there was no evidence that implementation of single parameter triggering systems alone improves hospital survival, and weak evidence of a reduction in cardiac arrest rates (2-). Four studies evaluated aggregate weighted scoring systems, there was evidence of improved hospital survival, reduced unplanned intensive care unit admissions and reduced cardiac arrest rates (2++). Evidence around length of hospital stay was inconclusive.

**Medical Emergency Teams (20 studies):** Medical emergency teams improve hospital survival (2++), reduce unplanned intensive care unit admissions (2+), and reduce cardiac arrest rates (2++). Their effect on length of hospital stay and intensive care unit mortality was unclear.

**Multidisciplinary Outreach Team (22 studies):** Outreach services are effective in reducing readmissions to intensive care unity (2+) and reduce hospital mortality (2+). There was weaker evidence to suggest that multidisciplinary teams are effective (2-).

**Authors’ conclusions**
A whole system approach should be adopted and aggregate weighted scoring systems were more effective than single parameter systems. Much of the available evidence was poor quality.

**CRD commentary**
This review addressed a clear question with reasonable inclusion criteria. The literature searches covered the main databases, but the exclusion of grey literature and non-English papers may have introduced bias. The review processes were partially described making it difficult to rule out reviewer error or bias. Included studies were detailed in tables however there was little information available regarding the participants. A recognised process of quality assessment and evidence synthesis was followed, however it was unclear why a narrative synthesis was performed rather than formal meta-analysis. While the results presented reflected the available evidence it was unclear how the firm recommendations had been derived from the poor quality evidence, therefore these should be considered with caution.

**Implications of the review for practice and research**
**Practice:** The authors stated a number of recommendations for practice were made including the implementation of an aggregate weighted scoring system, incorporation of medical emergency teams and the development of outreach services than focus on ward staff education and support.

**Research:** The authors stated future research should focus on exploring the effects of comprehensive emergency response processes that include both afferent and efferent limbs of response systems plus educational methods. Within the UK, research should focus on the integration of medical response teams into more comprehensive early warning response systems.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.