Supplement: Rapid-Response Systems as a Patient Safety Strategy

DATABASE SEARCHED & TIME PERIOD COVERED:
PubMed: 2000-10/1/2012

LANGUAGE:
English

SEARCH STRATEGY:
"Hospital Rapid Response Team"[Mesh] OR "rapid response team" OR "rapid response teams" OR "rapid response system" OR "rapid response systems" OR "medical emergency team" OR "medical emergency teams" OR "critical care outreach team" OR "critical care outreach teams" OR "patient at-risk team" OR "patient at-risk teams" OR "patient at risk team" OR "patient at risk teams" OR "emergency medical team" OR "emergency medical teams"
AND
effectiv* OR implement* OR success* OR fail* OR utiliz* OR adopt*

OR

"patient care" AND team* AND (emergency OR emergencies OR rapid OR "critical care")
AND
effectiv* OR implement* OR success* OR fail* OR utiliz* OR adopt*

NUMBER OF RESULTS: 1751

DATABASE SEARCHED & TIME PERIOD COVERED:
CINAHL: 2000-10/2/2012

SEARCH STRATEGY:
"rapid response team" OR "rapid response teams" OR "rapid response system" OR "rapid response systems" OR "medical emergency team" OR "medical emergency teams" OR "critical care outreach team" OR "critical care outreach teams" OR "patient at-risk team" OR "patient at-risk teams" OR "patient at risk team" OR "patient at risk teams" OR "emergency medical team" OR "emergency medical teams"
AND
effectiv* OR implement* OR success* OR fail* OR utiliz* OR adopt*

OR

"patient care" AND team* AND (emergency OR emergencies OR rapid OR "critical care")
AND
effectiv* OR implement* OR success* OR fail* OR utiliz* OR adopt*
Search modes - Phrase Searching (Boolean)

**NUMBER OF RESULTS: 357**
**DATABASE SEARCHED & TIME PERIOD COVERED:**
**EMBASE: 2000-10/1/2012**

**SEARCH STRATEGY:**
'rapid response team'/exp OR 'rapid response team' OR 'rapid response teams'/exp OR 'rapid response teams' OR 'rapid response system'/exp OR 'rapid response system' OR 'rapid response systems'/exp OR 'rapid response systems' OR 'medical emergency team'/exp OR 'medical emergency team' OR 'medical emergency teams'/exp OR 'medical emergency teams' OR 'critical care outreach team' OR 'critical care outreach teams' OR 'patient at-risk team' OR 'patient at-risk teams' OR 'patient at risk team' OR 'patient at risk teams' OR 'emergency medical team' OR 'emergency medical teams' OR (('patient care' NEAR/3 team*) AND (emergency OR emergencies OR rapid OR 'critical care')) AND effectiv* OR implement* OR success* OR fail* OR utiliz* OR adopt*

**NUMBER OF RESULTS: 621**

**DATABASE SEARCHED & TIME PERIOD COVERED:**
**Cochrane: 2000-10/1/2012**

**SEARCH STRATEGY:**
"rapid response team" OR "rapid response teams" OR "rapid response system" OR "rapid response systems" OR "medical emergency team" OR "medical emergency teams" OR "critical care outreach team" OR "critical care outreach teams" OR "patient at-risk team" OR "patient at-risk teams" OR "patient at risk team" OR "patient at risk teams" OR "emergency medical team":ti,ab,kw OR "patient care":ti,ab,kw AND team* AND (emergency OR emergencies OR rapid OR "critical care"):ti,ab,kw

**NUMBER OF RESULTS: 72** (Syst Revs – 4, Other Revs – 7, Clin Trials – 55, Econ – 6)
Figure. Summary of Evidence Search and Selection


Additional records identified through other sources (n = 0)

Records after duplicates (n=241) removed (n = 2560)

Records screened (n = 2560)

Records excluded (n = 2328)
Reasons for exclusion*:
- Not a study of RSS: 2074
- No original data: 376
- Does not measure implementation, electiveness, context or adoption: 86
- Not inpatient setting: 78
- Abstract only: 46
- Does not apply to key questions: 48
- No comparison group: 38
- Other: 1

Full-text articles assessed for eligibility (n = 232)

Full-text articles excluded, with reasons (n = 188)
Reasons for exclusion*:
- Not a study of RSS: 26
- No original data: 29
- Does not measure implementation, electiveness, context or adoption: 36
- Not inpatient setting: 3
- Abstract only: 34
- Does not apply to key questions: 55
- No comparison group: 11
- Other: 5

Studies included for full systematic review (n = 44)

Studies included on effectiveness (n = 26)

Studies included in for implementation (n = 17)
Table 1. PICOTS

<table>
<thead>
<tr>
<th>Elements</th>
<th>Population</th>
<th>Intervention</th>
<th>Comparator</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>Patients on general hospital wards - Adult and pediatric</td>
<td>Rapid Response Systems</td>
<td>Effectiveness: Usual practice</td>
<td>Technology/tools: criteria for activating team (extended vs restricted criteria), investment in human resources (team availability)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Staff selection/training: Physician on team (MET model) vs. Nurse –led (RRT model); investment in team and floor staff</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>- Identifying/addressing barriers/facilitators: Reluctance to call team, nursing workload, availability of team to respond</td>
</tr>
<tr>
<td>Outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Mortality (total or preventable)</td>
<td>• Incidence of cardio-respiratory arrest</td>
<td>• Unanticipated intensive care unit admission</td>
<td></td>
</tr>
<tr>
<td>Timing</td>
<td>Before and after intervention</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Settings</td>
<td>Hospitals</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Inclusion/exclusion criteria:**

Studies from all countries and languages were included

Effectiveness: Included all studies with a comparison group and at least some component of an RRS. Critical Care Outreach Team studies were included if they also included a pre-intensive care unit RRS component (general response to all ward patients). Effectiveness studies were only included after November 2008, the end date for a high-quality systematic review and meta-analysis.

Implementation: Included qualitative and quantitative studies addressing implementation. Studies were defined as qualitative research studies if they used a formal qualitative methodology such as interviews, focus groups, or ethnography. Studies were defined as quantitative implementation studies if they evaluated the impact of a change or difference in implementation strategy on utilization of the RRS and/or patient outcomes.
### Table 2. RRS Summary Table: Implementation Studies

<table>
<thead>
<tr>
<th>Author, year</th>
<th>Main Study objective</th>
<th>Implementation Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adelstein, 2011 (52)</td>
<td>To assess if new strategies could improve the time to delivery of MET</td>
<td>Tools: centralized activation system, review of all events, automatic escalation to code team if MET did not respond within 30 min Staff/training: nurse educator for training and compliance</td>
</tr>
<tr>
<td>Buist, 2007 (67)</td>
<td>To assess impact of change programs (education for nurses and housestaff)</td>
<td>Staff/training: nurse liaison, development and education</td>
</tr>
<tr>
<td>Calzavacca, 2010 (48)</td>
<td>To assess impact of maturation of an RRS on the failure to rescue rate (recognition of deterioration) and associated outcomes</td>
<td>Barriers/facilitators: Maturation of system over time</td>
</tr>
<tr>
<td>Chen, 2010 (57)</td>
<td>To compare reasons for calling emergency help between hospitals with a MET and those without</td>
<td>Barriers/facilitators: worry about the patient, effect of teaching hospital, metropolitan hospital, patient location and time of activation</td>
</tr>
<tr>
<td>Cretikos, 2007 (53)</td>
<td>To assess process components of MET implementation correlated with utilization</td>
<td>Barriers/facilitators: knowledge of activation criteria, understanding of MET purpose, perceptions of readiness for change, overall attitude to MET program</td>
</tr>
<tr>
<td>Donaldson, 2009 (51)</td>
<td>To identify factors associated with successful implementation across hospitals- qualitative</td>
<td>Barriers/facilitators: Extra resources, rapid transfer, communication enhancement, &quot;one stop shopping&quot; (single team assessment), strength of adoption</td>
</tr>
<tr>
<td>Foraida, 2003 (62), DeVita, 2004 (9)</td>
<td>To determine if specific educational and feedback interventions would increase MET utilization</td>
<td>Tools: immediate review of all stat sequential paging events, feedback to those involved in delaying MET activation, creating better objective alert criteria, dissemination and education for those new criteria.</td>
</tr>
<tr>
<td>Author, year</td>
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<tr>
<td>-------------</td>
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</tr>
</tbody>
</table>
| Genardi, 2008 (58) | To revitalize existing RRT and improve code reductions | Tools: rewards program (recognition of effort), improved documentation, alter alert criteria, increase access to RRT, change to centralized paging  
Staff/education: education, support for nurses, critical thinking skills, ensure competencies |
| Jones, 2006 (61) | To assess whether systems changes in existing MET would increase utilization rate | Tools: Method of activation (changing activation methods to separate the teams), triggers (changing alert criteria for calling MET)  
Staff/training: team composition (separation of unified code/MET into separate teams with separate activations), re-education on purpose of MET, criteria, and the changes |
<p>| Jones, 2006 (63) | To assess education program to increase utilization of existing MET | Staff/training: education, improved communication, on-the-job aids (e.g., posters, observational charts) |
| Jones, 2010 (59) | To determine if mandatory MET activation improves outcomes compared to elective | Tools: conversion from elective MET activation to mandatory based on alert criteria |
| Mackintosh, 2012 (54) | To examine social contexts and implementation of rapid response systems - qualitative | Barriers/facilitators: leadership/strategic vision; organizational structure/project management; audit/feedback on missed activations; training and education, team support |</p>
<table>
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<th>Main Study objective</th>
<th>Implementation Themes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peebles, 2012 (60)</td>
<td>To evaluate modifiable causes of delay in treatment of deteriorating patients - qualitative</td>
<td>Barriers/facilitators: delays in activation from the time of the first trigger score; problems with team performance: medical staff did not relay critical information to nursing staff and staff were distracted from assisting the RRT patient because of competing interruptions and other duties; delays due to logistical problems (i.e. equipment) or staff lack of competencies; lack of ICU beds for transfer</td>
</tr>
<tr>
<td>Shapiro, 2010 (50)</td>
<td>To determine nurses’ perceptions of RRS impact on practice and what constitutes a successful RRS – qualitative</td>
<td>Barriers/facilitators: Nurse enthusiasm about teams; clarity about when to call team; concerns about being reprimanded for calling team; institutional and individual inertia; concerns about who would care for other patients during a call</td>
</tr>
<tr>
<td>Shearer, 2012 (55)</td>
<td>To explore cognitive and sociocultural barriers to activating the RRS - qualitative</td>
<td>Barriers/facilitators: Cognitive barriers -not recognizing that the patient met the calling criteria; Sociocultural-concerns about colleagues' perceptions of them; felt that they should be able to manage patients by themselves (had necessary expertise), or felt patient had already been discussed with ICU team and continued responsibility was unclear; poor communication prioritization</td>
</tr>
<tr>
<td>Author, year</td>
<td>Main Study objective</td>
<td>Implementation Themes</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>Soo, 2009 (56)</td>
<td>To evaluate major features of the patient safety practice champion role</td>
<td>Barriers/facilitators: Both executive and managerial champions were important; were skilled communicators, well-respected and familiar with institutional culture. Champions were educators, advocated for RRT, built relationships, and navigated boundaries between professions/units.</td>
</tr>
<tr>
<td>Williams, 2011 (59)</td>
<td>To clarify nurse perceptions of RRS – qualitative</td>
<td>Barriers/facilitators: advantages of RRT to nurses (develops skills, autonomy, resource and way to circumvent unit problems), perceived benefits for patients; degree of teamwork with RRT; RRT skills; concerns about activating an RRT</td>
</tr>
</tbody>
</table>