



Simulation and education

Measuring teamwork performance: Validity testing of the Team Emergency Assessment Measure (TEAM) with clinical resuscitation teams[☆]



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ABSTRACT

Aim: To test the resuscitation non-technical Team Emergency Assessment Measure (TEAM) for feasibility, validity and reliability, in two Australian Emergency Departments (ED).

Background: Non-technical (teamwork) skills have been identified as inadequate and as such have a significant impact on patient safety. Valid and reliable teamwork assessment tools are an important element of performance assessment and debriefing processes.

Methods: A quasi experimental design based on observational ratings of resuscitation non-technical skills in two metropolitan ED. Senior nursing staff rated 106 adult resuscitation team events over a ten month period where three or more resuscitation team members attended. Resuscitation events, team performance and validity and reliability data was collected for the TEAM.

Results: Most rated events were for full cardiac resuscitation (43%) with 3–15 team members present for an average of 45 min. The TEAM was found to be feasible and quickly completed with minimal or no training. Discriminant validity was good as was internal consistency with a Cronbach alpha of 0.94. Uni-dimensional and concurrent validity also reached acceptable standards, 0.94 and >0.63 ($p < 0.001$), respectively, and a single 'teamwork' construct was identified. Non-technical skills overall were good but leadership was rated notably lower than task and teamwork performance indicating a need for leadership training.

Conclusion: The TEAM is a feasible, valid and reliable non-technical assessment measure in simulated and real clinical settings. Emergency teams need to develop leadership skills through training and reflective debriefing.

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Introduction

Delivering quality care and ensuring patient safety is an individual, organisational and international responsibility that requires an understanding of errors, near misses and adverse events.¹ One in ten hospital patients in the USA, Canada, the UK, Australia and New Zealand will suffer an adverse event while in hospital,² many of which are related to inadequate communication and teamwork.³ An understanding of these 'human factors' and 'non-technical' skills (leadership, teamwork, situation awareness and decision making) are therefore essential with benefits to patient safety and the quality of care.⁴ However, measurement of non-technical skills can be

difficult, especially in the emergency situation, and by necessity encompass a degree of subjectivity. Assessment tools must therefore be rigorously tested to ensure their feasibility, reliability and validity.^{5–7}

Rating scales are available for the measurement of teamwork,⁸ crisis resource management,⁹ anaesthetic and surgeons non-technical skills,¹⁰ as well as broadly focussed emergency teamwork measures such as the Mayo high performance teamwork scale.¹¹ Specifically designed for emergency teams the Team Emergency Assessment Measure (TEAM) is a 12-item assessment measure used to rate leadership, teamwork, and task management using a 5 point Likert scale. Previous testing in simulated scenarios has demonstrated that the TEAM is valid and reliable^{12,13} with, for example, strong uni-dimensional and high internal consistency (Cronbach alphas of 0.91 and 0.97). Further, the tool is feasible for the emergency workplace—taking less than a minute to complete.¹⁴ However, the instrument has not been tested in a real clinical setting and therefore the aim of this study was to assess the validity, reliability and feasibility of the TEAM for resuscitation attempts in two Australian Emergency Departments (ED).

Methods

A quasi experimental design was employed to collect observational ratings of non-technical skills in two metropolitan EDs in Australia. All staff were provided information on the study and invited to attend a 60-min non-compulsory briefing covering the TEAM use which included the rating of three video recorded resuscitation attempts. These three records were deliberately selected as they displayed examples of good, average and poor teamwork skills. In total 128 registered nurses attended from which senior registered nurses were selected to complete the TEAM during the prospective trial. Assessment of outcomes from these training events indicated that trainees and the TEAM successfully discriminated between events (discriminant validity) with a one-way ANOVA revealing applicable and significant differences in total scores for the three resuscitation events ($F(2, 382) = 64.265$, $p < 0.001$).

Senior nurse resuscitation team members were then asked to complete the TEAM immediately after a resuscitation event in both ED. Logistically it was not possible to recruit a non-participant observer in each department and it would not have been applicable to use ratings from a medical team member as it is likely that they would be rating their own leadership skills. Inclusion criteria for a resuscitation team non-technical skills rating included:

- At least three resuscitation team members working together at a resuscitation call that lasted for five minutes or longer.
- Patients aged ≥ 18 years of age.

Resuscitation categories were classified as: respiratory and/or cardiac; trauma; respiratory emergency; cardiovascular emergency; neurological emergency; shock—all causes; or 'other'. 'Immediate survival' was defined as survival for at least one hour. Data was collected from April 2014 to January 2015.

The instrument

The TEAM scale includes 11 items which are rated on a five-point scale—'0' (Never/hardly ever) to '4' (Always/nearly always) covering 'Leadership' [2 items]; 'Teamwork' [7 items] including situation awareness; and 'Task management' [2 items]. The final 12th item is designed as an overall 'global' rating of performance on a scale of 1–10. For rating and debriefing purposes users can choose to use the summative score for items 1–11, the global rating score, or both.

The TEAM tool is included in Appendix 1 and the tool and users' guide are available free at <http://medicalemergencyteam.com/>.

In this study each rater was also required to document patient demographics (resuscitation type, age, sex and healthcare outcome), event details (date, time, duration, number of attending clinicians), plus personal data such as their profession and years of experience in ED.

Ethical approval

The study was approved by the health service Ethics Committee and the university—Monash University Human Research and Ethics Committee.

Data analysis

Data were analysed using the computer program IBM-SPSS Version 22.¹⁵ Team performance assessed in 106 resuscitation events were analysed after substitution of <0.01% missing data. The objective was to report on patient and event characteristics, TEAM scores, uni-dimensional, concurrent and construct validity and internal consistency/reliability. The analysis approach paralleled the original TEAM development¹² using summary and inferential statistics. For example, Cronbach alpha coefficient for internal consistency and Spearman's (rho) for ordinal data correlations. Construct validity was examined via an exploratory Principal Component Analysis¹⁶ after confirmation that data met all criteria for factorability.

Results

Forty registered-nurse (RN) rated 106 resuscitation team events in two ED: Hospital A: $n = 43$ (40.6%) and Hospital B: $n = 63$ (59.4%). RNs mean emergency experience was 5.5 years (SD = 5.6; range: 1–20 years). Of these, 28 had attended a training session and rated all but 10 events (the remainder were rated by a RN who had not attended training). The average number of events rated by each RN was 2.6 (range: 1–24).

Patient and event characteristics

Where TEAM documentation was completed patients requiring resuscitation had a mean age of 58.5 years (SD 19.9; range 21 to 96 years) and over half were male (58.2%; $n = 57$). Reports were spread over ten months, averaging 8 per month, with most resuscitation ratings occurring between 0700 h and midday ($n = 38$; 38.9%) and least between midnight and 0700 h ($n = 13$; 12.6%).

The primary reason for resuscitation was¹:

- Respiratory/cardiac arrest ($n = 43$, 41%),
- followed by neurological emergencies ($n = 24$, 23.1%),
- trauma ($n = 12$, 11.3%),
- respiratory emergencies ($n = 8$, 7.7%),
- shock—all causes ($n = 6$, 6.7%),
- and cardiovascular emergencies ($n = 4$, 3.8%).

The number of attending clinicians at each event ranged from 3 to 15 (median = 6) and the mean duration was 45 min (SD 32.6, range 5–240 min). Overall immediate survival rates were 77.1% (81 patients), however in patients where full respiratory/cardiac resuscitation was required—29 patients (67.4%) survived and 13 died. For full cardiopulmonary resuscitation attempts [$n = 42$] there

¹ Missing data—6.4%.

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