

QUALITY AND PATIENT SAFETY

Validation of a measurement tool for self-assessment of teamwork in intensive care

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Editor's key points

- Poor teamwork in healthcare increases the risk of medical error.
- This study evaluated a self-assessment tool that measured aspects of communication, coordination, behaviours, and leadership after simulated critical events.
- The measurement tool was valid, accurately measuring key aspects of teamwork, and could discriminate levels of performance.
- Valid and reliable measures of team performance should stimulate quality improvement in healthcare.

Background. Teamwork is an important contributor to patient safety and a validated teamwork measurement tool could help healthcare teams identify areas for improvement and measure progress. We explored the psychometric properties of a teamwork measurement tool when used for self-assessment. We hypothesized that the tool had a valid factor structure and that scores from participants and external assessors would correlate.

Methods. Forty intensive care teams (one doctor, three nurses) participated in four simulated emergencies, and each independently rated their team's performance at the end of each case using the teamwork measurement tool, without prior training in the use of the tool. We used exploratory factor analysis (EFA) and confirmatory factor analysis (CFA), and compared factor structure between participants and external assessors (using previously reported data). Scores from participants and external assessors were compared using Pearson's correlation coefficient.

Results. EFA demonstrated items loaded onto three distinct factors which were supported by the CFA. We found significant correlations between external and participant scores for overall teamwork scores and the three factors. Participants agreed with external assessors on the ranking of overall team performance but scored themselves significantly higher than external assessors.

Conclusions. The teamwork measurement tool has a valid structure when used for self-assessment. Participant and external assessor scores correlated significantly, suggesting that participants could discriminate between different levels of performance, although leniency in self-assessed scores indicated the need for calibration. This tool could help structure reflection on teamwork and potentially facilitate self-directed, workplace-based improvement in teamwork.

Keywords: educational; healthcare team; measurement; reliability and validity; self-assessment; simulation; teamwork

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Teamwork is recognized as a key factor in patient safety, with an established relationship between poor teamwork and medical error.^{1–3} Conversely, there is evidence suggesting that good team performance relates to patient safety⁴ and teams appear to make fewer mistakes than do individuals.^{5,6} Effective approaches to communication, coordination, and leadership are well established in the literature on teams,^{7,8} and it would be desirable to apply these to healthcare teams.

While Salas and colleagues⁹ argue that teamwork training (in a variety of domains) can be effective, the research on teamwork training initiatives in healthcare is less conclusive.¹⁰ Teamwork training initiatives are frequently resource intensive, off-site, simulation-based, and rely on external faculty to conduct the course and provide feedback on team performance. This has high costs and limits access to training and opportunities for recurrent exposure.¹¹

A validated teamwork self-assessment tool could be of value to improve the performance of healthcare teams. It could be argued that team training initiatives should be grounded in the workplace with teams who regularly work together, enabling regular, self-directed activities to improve team performance. Learning through reflective analysis of the experience can be guided by a structure to help create clear action points.^{12 13} A teamwork measurement tool could help structure this reflection, but most available teamwork measurement tools have not been well validated in healthcare settings or for self-assessment.¹⁴

The validity of an assessment has traditionally been subdivided into content validity, criterion validity, and construct validity. Content validity is the extent to which the test is a representative sample of the many items that could reflect the essence of the environment or attribute of interest (in this case 'teamwork'), and is usually established through the judgement of experts enlisted to make judgement on the extent to which the test items match the test objectives. Criterion validity looks for correlations between the test being validated and an established outside measure. The traditional definition of construct validity is that the test is measuring the construct it claims to be measuring, be it an attribute, proficiency, or in this instance, teamwork behaviours.

These different concepts overlap and in educational measurement circles, these three types of validity are now considered as facets in a unified concept of construct validity,¹⁵ the definition we use in this study. The construct validity of a test should be demonstrated by an accumulation of evidence from multiple perspectives.

We have previously reported the psychometric properties of a structured teamwork measurement tool used by trained external assessors to rate team performance in a simulated critical event¹⁶ including our method for establishing content validity of the tool. We further reported on its use to determine the effectiveness of a simulation-based intervention to improve performance of intensive care teams.¹⁷ In the present study, we use a range of methods to explore the construct validity of the same tool when used by participants to rate the teams they are part of, including factor analysis, correlation coefficients, and a range of comparisons with results from external assessors.

The aim was to provide evidence to support the validity of this teamwork measurement tool when used for self-assessment of teamwork in the context of intensive care. We hypothesized that the tool had a valid factor structure and that scores from participants and external assessors would correlate.

Methods

The study reported here is part of a larger study on the evaluation of a teamwork measurement tool, during which 40 intensive care teams comprising doctors and nurses each undertook four simulations of critical events. Each of these 160 simulations was rated by three trained external assessors and by participants, self-assessing their own team. The

external assessors and participants used the same measurement tool. We have previously reported on the results from the external assessors.¹⁶ Here, we report on the instrument when used for self-assessment, and compare external assessor and participant ratings.

Ethics approval was obtained from the Northern X Regional Ethics committee (NRX/07/07/076) and the hospital ethics committees from which participant teams were recruited.

The measurement tool

The structured teamwork measurement tool consisted of 23 items, each describing an observable marker of team performance and a score for overall teamwork performance. This was originally developed from the Mayo High Performance Teamwork Scale,¹⁸ modifying, adding, or deleting items based on review of the broader literature on teamwork, and on consensus after the use of the tool by a group of experts to score a series of videoed team performances. This development process is fully described elsewhere.¹⁶

Participants/sampling

We invited staff from all intensive care units (ICUs) within a defined region to participate in the study. Forty teams volunteered from nine different ICUs in eight hospitals (one hospital had two ICUs). Each team comprised one doctor and three nurses who regularly worked with each other and included a mix of junior and senior medical and nursing staff. Participants had no previous experience using the teamwork measurement tool, and no training before using it.

Simulations

We based scenario content on frequently occurring life-threatening events in the context of intensive care. We developed four standardized scenarios comprising two airway and two cardiovascular emergencies. We aimed for a high degree of realism, placing a METI patient simulator (Medical Education Technology Inc., Sarasota, FL, USA) in a recreated ICU, and using real drugs, fluids, equipment, and other consumables. Scenarios were run in real time and all clinical interventions had to be conducted as if in an actual clinical setting.

Conduct of study days

The study day began with structured briefings and a familiarization with the simulation environment followed by the first two scenarios. After the second scenario, there was a teaching session on teamwork, crisis management, and management of airway and cardiovascular emergencies after which the teams completed the third and fourth scenarios. The order of the scenarios was randomized, but each team undertook a cardiovascular and an airway scenario at the beginning of the day, and the other cardiovascular and airway scenario at the end of the day.

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