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Review

Assessing team performance – Markers and methods

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ABSTRACT

Optimal team performance in healthcare is vital to avoid error. Assessing teams improves their performance by providing accurate feedback to team members. To construct an assessment tool that is both valid and reliable, it is necessary to understand what should be measured, when it should be measured and the context of the team performance. Current assessment methods include observation of behavioural markers, self-assessment by team members, event-based coding, and narrative field notes. Future assessment tools should incorporate best practice elements such as having a theoretical or empirical basis for teamwork competencies, measuring process rather than outcomes, analysing rather than describing performance, capturing non-observable cognitions, distinguishing individual from collective team behaviours, using trained raters, and linking assessment to learning objectives.

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Contents

1. Introduction	00
2. Why should we assess team performance?	00
3. What should be assessed?	00
4. When we should assess	00
5. What methods of assessment are currently used	00
6. How should we develop team assessment methods in future?	00
7. Summary	00
References	00

1. Introduction

Traditionally we have thought the quality of healthcare to be dependent on an individual doctor's expertise. However, modern healthcare more closely resembles complex systems, which for successful functioning rely on teams performing several interdependent actions competently at the same time. Single-step task performance with a linear input-output relationship may be accurately attributed to an individual's action, but anything more complex requires several people to perform in concert. In the complex interactions of real life, competence becomes a shared

attribute and is dependent on competence of the collective [1]. In other words, 'patient care is a team sport' [2].

The term 'team' is a broad construct that may include anything from strategic teams, management teams, through to clinical healthcare teams. There are many definitions of what constitutes a team, but the principal features are that it is made up of two or more people, there is dynamic interaction between the individuals, there is interdependency and a common goal, there are specific member roles or functions, and it has a limited life span [3]. A team is distinguished from a group by its role differentiation, but more importantly, by its distribution of cognitive load [4]. This article will specifically address dynamic teams dealing with high-stakes situations, which typically possess the characteristics of having defined tasks, but with an unstable membership.

Evidence for the importance of team performance impacting on

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patient outcome has grown enormously after the Institute of Medicine report *To Err is Human* [5], which emphasised the point that frequently patient safety failures and error resulted from 'systemic' failures and not individual incompetence. There is now little debate that poor team functioning is at the root of most patient harm. This then begs the question of what is optimal team performance so that we are able to teach and propagate it. Which requires it to be assessed.

When making a judgement on the quality of a team's performance, most observers would agree with Justice Stewart's observation (in a different context), 'I know it when I see it' [6], but this superficial evaluation would provide an inadequate basis for improvement where performance is deemed sub-optimal. It also provides no structure on which to build an empirical or theoretic understanding of team functioning. To develop an adequate evidence base we also need to measure it. This article will review the current methods and markers of team performance assessment, but will not only address the question of how to assess it, but also when to assess it (context) and for what reason (purpose). It is not an exhaustive review of every team assessment method devised, but discusses the current views of what constitutes best practice.

2. Why should we assess team performance?

There are three intersecting reasons for wanting to know more about team performance – the emerging understanding of a team's contribution to the error paradigm, the changing nature of healthcare delivery away from an individual-expert dominated model towards a collective expertise one, and a greater appreciation of the healthcare environment becoming a complex milieu. The assessment of team performance is essential for an accurate understanding of how teams work so that processes can be improved for better outcomes.

Early models of error causation arose from industrial prototypes which posited that error arose from linear cause-and-effect pathways [7]. This conceptual model persisted in healthcare as the influential 'Swiss cheese' model propagated by Reason [8]. However, more recent understanding has changed to a view of patient safety and error being linked to 'systems' failure with an integral part of the system being the healthcare team.

Other high reliability industries have been earlier adopters of the concept of 'team training', the industry studied most intensively by anaesthetists being aviation. Human factors teaching began to be developed in the late 1970s, the result of which was Cockpit Resource Management (CRM) in 1979. The first CRM course was run by United Airlines in 1981 and evolved to the second generation CRM (now Crew Resource Management) in the late 80's, which was more team orientated with greater emphasis on authentic aviation operations. Third generation CRM moved to training in more authentic environments, combining human factor training on a functional flight deck, and progressed further to a 4th generation CRM in the 90's, with full mission simulation for specific airlines in which the teams operated.

In parallel with this increasing focus on team performance has been an evolving perspective on the environment in which the teams operated. There has been a growing use of complexity theory as a conceptual framework to explain modern healthcare [9–12], sometimes overwrought and misguided [13]. However, in terms of how teams operate it is a useful framework. It is worth further defining a continuum that operates in a healthcare setting, with 'complicated' and 'complex' at either end. The former has pathways that can be mapped and planned, with predictable outcomes, and the latter has pathways that are interdependent, unpredictable and whose relationships change every time they interact, giving rise to new unpredictable interactions. In healthcare a cardiac arrest team

performing resuscitation may be characterised as operating as part of a complicated 'system', whereas dealing with a patient with sepsis-induced multi-organ failure would be complex. The process for cardiac arrest resuscitation is highly protocolised with a limited number of interventions that can be applied (A-B-C), with little latitude for deviation, after which there is a dichotomous outcome (dead or alive). Comparison of a resuscitation team with a NASCAR pit crew [14] is therefore valid because each element of both processes can be finely choreographed to achieve a predictably effective performance. However, the same cannot be said for the acutely ill septic patient who needs a customised team performance each time, which requires flexibility, adaptation and innovation.

3. What should be assessed?

There is not uniform agreement about the terminology of teamwork competencies in the literature [15–17], for example around the terms human factors and non-technical skills, which will be used interchangeably in this article to reflect their common usage in the literature reviewed. However, it is important to distinguish the level at which teamwork is being examined to understand what is being assessed. Broadly, a team may be assessed for the effectiveness of the goals that are achieved (*outcomes*), or for the enacted behaviours (*processes*) it uses to achieve those goals. The entire enactment is usually termed the *performance* [18].

Global performance is the result of *taskwork* and *teamwork*, where the former describes the actions (knowledge, skills and attitudes) of individual team members and the latter the interactions between team members [19]. It has been argued that effectiveness is more the result of *teamwork* since a team of experts is not an expert team, demonstrated in many studies looking at performance of dynamic teams such as flight-deck crews on aircraft carriers [20]. Weick demonstrated that these crews worked as coherent units guided by a shared understanding of their goals, rather than individually competent members. The concept of collective competence was proposed by Boreham [21–23], and fits with an emerging discourse which describes the competence as something that is dynamic, context-sensitive, distributed, interdependent, and evolving, rather than a stable 'state' that can be possessed [24]. This conceptualisation is variously related to the allied concepts of interactive consciousness, group consciousness and collective intelligence [25,26]. However, assessment at the level of single team members does provide an opportunity for targeted feedback for improved effectiveness at the level of individuals.

4. When we should assess

The characteristics of the assessment method will be determined by its primary purpose, be it for measurement only (research), learning (formative) or high stakes decision-making (summative). There may be cross-over between these functions, but tensions may arise for both the assessor and the assessed if goals are divergent. For example, an overall rating of teamwork performance across an observed performance episode may be useful for determining whether a focussed learning intervention has been effective, but will provide little substrate for specific feedback to members for improvement. Effective learning requires the capture and feedback of specific knowledge, skills and behaviours that contribute to good teamwork.

Team performance can be assessed *in vivo* (workplace) or *in vitro* (simulated environment). The former is an uncontrolled environment that may be more amenable to retrospective analysis of a recorded performance, or several raters may be required to distribute the high cognitive load. A simulated environment creates opportunities to direct performance so that particular behaviours

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