

# Integrating Teamwork into the “DNA” of Graduate Medical Education: Principles for Simulation-Based Training

EDUARDO SALAS, PHD  
MICHAEL A. ROSEN, MA  
HEIDI B. KING, MS

It has been over a decade since the seminal Institute of Medicine report *To Err Is Human*<sup>1</sup> was published, and the importance of teamwork in safety and quality of care is now broadly recognized and accepted. However, clinicians and medical educators continue to struggle to integrate team concepts into curricula and quality improvement projects. There have been successes, but progress to date has been slower and less widespread than the urgency of the problem requires.

Simulation-based training (SBT) is a powerful strategy to reach this end product of effective team-based care. However, as with any tool, the effectiveness of the results depends on how it is used. The use of SBT for developing teamwork in health care is growing, but in order to reach its full potential, simulation and teamwork must be fully integrated within educational, training, and professional development programs. It needs to move from an afterthought to an inseparable aspect of the full range of care-provider career development.

This brief article presents a series of principles rooted in the science of teams and instructional design as well as lessons learned the hard way in other safety-critical industries. These principles focus on maximizing the potential of SBT not only as a stand-alone learning experience, but as a component of a larger professional development program.

## Integrate SBT Within the Broader Pedagogical System

Simulation-based training is a strategy for creating and implementing practice-based learning activities. Even though it is a powerful tool, it works best when it is aligned with the bigger picture of an educational or training

program. Practice-based learning is most likely only one of several training methods used in building teamwork skills. Information (eg, lectures, readings) and demonstration-based delivery methods (eg, role-modeling, video vignettes) as well as on-the-job performance support (eg, coaching and mentoring) should be used as well. All of these activities should work in concert, and planning is required to make this happen.

## Use the Science of Teams

Although there is a need for more contextualized research into effective teamwork within various types of health care teams, there is a strong theoretical and empirical base from which to draw.<sup>2,3</sup> There are, of course, differences in what makes teams effective in different contexts; however, fundamental issues in collective performance can serve as a starting point for building a robust science of health care team performance.

## Build a Curriculum Around Teamwork Competencies—The Knowledge, Skills, and Attitudes Underlying Effective Teamwork

A teamwork curriculum needs to start with a clear specification of the full range of teamwork competencies to be trained, such as knowledge, skills, and attitudes underlying effective teamwork. This may be different for different clinical areas, but in general they will be variations of communication, coordination, and collaboration behaviors.<sup>4</sup>

## Develop and Use Clear and Precise Learning Objectives

In order to systematically and reliably reach a goal (ie, improve team performance), a scenario should have tightly defined learning objectives, that is, statements specifying the specific knowledge or skills a learner should possess after completing a learning activity. Each scenario should identify the teamwork competencies targeted for acquisition. This is key for designing scenarios that are effective and have built-in measurement capabilities to drive feedback.

## Carefully Plan What Happens Before, During, and After SBT

An SBT learning event should not be considered a stand-alone activity. Factors outside the actual practice activity can greatly impact learning and transfer.<sup>5,6</sup> Therefore, a

**Eduardo Salas, PhD**, Professor of Psychology, Department of Psychology and the Institute for Simulation and Training, University of Central Florida; **Michael A. Rosen, MA**, Graduate Research Associate, Department of Psychology and the Institute for Simulation and Training, University of Central Florida; **Heidi B. King, MS**, Director Healthcare Team Coordination Program Office of the Assistant Secretary of Defense (Health Affairs) TRICARE Management Activity.

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Corresponding author: Eduardo Salas, PhD, Professor of Psychology, Department of Psychology and the Institute for Simulation and Training, University of Central Florida, 3100 Technology Parkway, Orlando, FL 32826, 407.882.1325, esalas@ist.ucf.edu

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systems perspective should be adopted wherein factors in the organization both before (eg, attitudes toward simulation and teamwork, resource availability) and after training are deliberately managed. This includes building a learning climate and aligning SBT with the policies and procedures already in place on the unit.

### Craft Scenarios to Meet Learning Objectives

In SBT, the scenario is the curriculum.<sup>7</sup> The scenario creates the boundaries of what trainees can practice and therefore what they can potentially learn in a given exercise. Consequently, great care must be taken in designing the scenario so that team members have opportunities to practice the targeted teamwork behaviors.<sup>8</sup>

### Provide Appropriate Feedback

Learning does not happen in the absence of feedback. The type, timing, and quality of feedback provided can greatly impact the quality of the learning experience. Feedback should be accurate, timely, corrective, and process-oriented (ie, focusing on teamwork behaviors). Feedback is most frequently achieved via facilitated debriefs in SBT for teams; therefore, facilitation skills need to be carefully developed in health care trainers and educators.<sup>9</sup>

### Diagnose Performance

Measurement is important to SBT for the same reasons it is important to any program of instruction. It helps to identify areas for improvement in both the learning experience and the learner.<sup>10</sup> To this end, performance measurement should seek to diagnose team performance, to provide information about the underlying causes of why things did or did not go well. Performance diagnosis involves tying effective and ineffective performance to the competencies targeted for training in order to target deficiencies for improvement.

### Use Well-Constructed Observational Protocols

It is difficult to avoid observation when measuring team performance. Developing observational tools can be a challenge, but guidance in the form of best practices is available.<sup>8</sup> In general, observational protocols should take advantage of the control afforded by simulation. If the scenario is engineered appropriately, observers should know when to be looking for what; that is, measurement

opportunities should be tied to event sets in the scenarios requiring teamwork behaviors.

### Balance Strengths and Weaknesses of Learning Activities

There are many different ways to implement a simulation program (eg, simulation center vs in situ simulation). No one approach is perfect, and ideally decisions about a training program should balance the learning value of activities and practical constraints to make the most of the available resources (eg, access to training devices, staff time). Teamwork training does not *require* access to simulators with high physical fidelity. A broad range of practice activities can be employed.

### Concluding Remarks

The transformational journey of health care toward a safe, high-reliability, and team-based industry has begun. The principles offered here are based on the science of teams and instruction, and summarize hard-won lessons that were learned across a variety of domains making this same journey toward safety. Much is left to be done before teamwork is the standard operating procedure in health care, but health care educators can benefit from those who have gone before them.

### References

- 1 Kohn LT, Corrigan JM, Donaldson MS, editors. *To Err is Human: Building a Safer Health System*. Washington, DC: National Academy Press; 1999.
- 2 Kozlowski SWJ, Ilgen DR. Enhancing the effectiveness of work groups and teams. *Psychol Sci Public Interest*. 2006;7(3):77–124.
- 3 Salas E, Cooke NJ, Rosen MA. On teams, teamwork and team performance: discoveries and developments. *Hum Factors*. 2008;50(3):540–547.
- 4 Salas E, Wilson KA, Murphy CE, King H, Salisbury M. Communicating, coordinating, and cooperating when lives depend on it: tips for teamwork. *Jt Comm J Qual Patient Saf*. 2008;34(6):333–341.
- 5 Salas E, Almeida SA, Salisbury M, et al. What are the critical success factors for team training in health care? *Jt Comm J Qual Patient Saf*. 2009;35(8):398–405.
- 6 Cannon-Bowers JA, Rhodenizer L, Salas E, Bowers CA. A framework for understanding pre-practice conditions and their impact on learning. *Pers Psychol*. 1998;51:291–320.
- 7 Salas E, Priest H, Wilson KA, Burke, CS. Scenario-based training: improving military mission performance and adaptability. In: Adler AB, Britt TW, eds. *Military Life: The Psychology of Serving in Peace and Combat*. Westport, CT: Praeger Security International; 2006.
- 8 Rosen MA, Salas E, Wu TS, et al. Promoting teamwork: an event-based approach to simulation-based teamwork training for emergency medicine residents. *Acad Emerg Med*. 2008;15(11):1190–1198.
- 9 Fanning RM, Gaba DM. The role of debriefing in simulation-based learning. *Simul Healthc*. 2007;2(2):115–125.
- 10 Salas E, Rosen MA, Burke CS, Nicholson D, Howse WR. Markers for enhancing team cognition in complex environments: the power of team performance diagnosis. *Aviat Space Environ Med* 2007;78(5):B77–B85.