Does Team Training Work? Principles for Health Care

Eduardo Salas, PhD, Deborah DiazGranados, MS, Sallie J. Weaver, MS, Heidi King, MS

Abstract

Teamwork is integral to a working environment conducive to patient safety and care. Team training is one methodology designed to equip team members with the competencies necessary for optimizing teamwork. There is evidence of team training's effectiveness in highly complex and dynamic work environments, such as aviation and health care. However, most quantitative evaluations of training do not offer any insight into the actual reasons why, how, and when team training is effective. To address this gap in understanding, and to provide guidance for members of the health care community interested in implementing team training programs, this article presents both quantitative results and a specific qualitative review and content analysis of team training implemented in health care. Based on this review, we offer eight evidence-based principles for effective planning, implementation, and evaluation of team training programs specific to health care.

ACADEMIC EMERGENCY MEDICINE 2008; 15:1002–1009 © 2008 by the Society for Academic Emergency Medicine

Keywords: team training, teamwork, team effectiveness, education

Patient care is a team sport. However, health care is unique in that no other team sport has greater potential for catastrophic outcomes. To this end, patient safety is directly impacted by teamwork. Recent Joint Commission reports indicate communication, one of the central components of teamwork, as the root cause for nearly 70% of sentinel events.[1] Furthermore, the link between teamwork and patient outcomes has been demonstrated by a recent RAND report.[2] The report reviewed 16 studies and found empirical support for the relationship between teamwork behaviors (e.g., coordination, mutual respect, role clarity, shared goals, debriefing) and clinical patient outcomes (e.g., risk-adjusted mortality, cardiac arrests, nosocomial infections, adverse events, adverse drug events, complications). As the understanding of this link has grown, health care providers and administrators seek to optimize teamwork. Team training has become the strategy of choice. It has become a national obsession, especially with the release of the TeamSTEPPS program by the Department of Defense.[3]

Health care is an evidence-based field; therefore, many providers and administrators are looking for evidence that team training is effective. Does it impact patient safety? Does it improve the work environment? Does team training work? YES, it does. At least the evidence is encouraging and in the right direction.[4–6] Team training provides an effective vehicle for optimizing team-based competencies in health care. When designed systematically following the science of learning, training equips providers with the knowledge, skills, and attitudes (KSAs) necessary to be an effective team member. Training also provides opportunities to practice (when used with simulation) both task- and team-related skills in a "consequence-free" environment, where errors truly are opportunities for learning and providers receive feedback that is constructive, focused on improvement, and nonjudgmental.

The purpose of this article is twofold: to present findings that support the prediction that team training enhances team effectiveness and to present the critical principles necessary for team training to work in health care. To that end, this paper begins by briefly defining teams, teamwork, and team training. We then present

From the Department of Psychology and the Institute for Simulation and Training, University of Central Florida (ES, DD, SJW), Orlando, FL; and the Office of the Assistant Secretary of Defense (Health Affairs), TRICARE Management Activity (HK), Washington, DC.

Received July 10, 2008; revision received July 22, 2008; accepted July 22, 2008.

Presented at the 2008 *Academic Emergency Medicine* Consensus Conference, "The Science of Simulation in Healthcare: Defining and Developing Clinical Expertise," Washington, DC, May 28, 2008.

Disclaimer: All opinions expressed in this paper are those of the authors and do not necessarily reflect the official opinion or position of the University of Central Florida, or the Department of Defense.

Address for correspondence and reprints: Eduardo Salas, PhD; e-mail: esalas@ist.ucf.edu.

ISSN 1069-6563
PII ISSN 1069-6563583
© 2008 by the Society for Academic Emergency Medicine
doi: 10.1111/j.1553-2712.2008.00254.x

and summarize results of several quantitative investigations on team training, as well as a qualitative investigation of the team training literature specific to health care. Through quantitative techniques we gain insight into the true effects of training on important outcomes and the effects of various factors on training effectiveness. However, purely quantitative techniques do not allow for a complete understanding of what effective team training programs look like, how they are developed, and how they are executed. Therefore, we also include the results of an in-depth qualitative review and content analysis conducted on the team training literature specific to health care. The trends found in this review are formatted into eight key principles for effective team training in health care.

TEAMS, TEAMWORK, TEAM TRAINING, AND TEAM BUILDING

Teams

Teams are defined as interrelated individuals that are tasked to accomplish a common goal. More specifically, a team is defined as a set of two or more individuals who must interact and adapt to achieve specified, shared, and valued objectives.[7] That is, teams have meaningful task interdependencies, hold shared and valued objectives, use multiple information sources, possess adaptive mechanisms, and perform through intensive communication processes. The key characteristic of a team is task interdependency. The team members must not only communicate but they must also coordinate actions and cooperate so that they can accomplish a task.

Teamwork

Teamwork is an interrelated set of team member thoughts, behaviors, and feelings needed for the team to function as a unit. These are combined to produce a coordinated and adaptive set of individuals who produce value-added outcomes.[8,9] Recently, Salas and colleagues[8] presented a model of teamwork after conducting a thematic analysis of the most commonly discussed variables in the literature that had the greatest effect on team performance. What resulted was a model that was both supported by the literature and practically relevant. The framework consists of five core components (labeled the ''big five'') that promote team effectiveness and coordinating mechanisms that enable a team to ''meld together the value of each of the five factors.'' The ''big five'' of teamwork are team leadership, mutual performance monitoring, backup behavior, adaptability, and team orientation. The coordinating mechanisms are shared mental models, mutual trust, and closed-loop communication. We direct the reader to Table 1 for more information on the ''big five'' and the coordinating mechanisms.

Team Training

Team training is the set of tools and methods that form an instructional strategy,[10] which provide team members with the opportunity to practice skills and receive feedback in a rich learning environment. Not every form of team training is the same. The strategy is dependent on many variables, such as the KSAs that need to be trained, and the resources available. Regardless of strategy, team training focuses on the development of a robust instructional method for influencing team processes and outcomes. Team training comes to life when available tools (e.g., team task analysis, performance measurement, or task simulation and exercises), delivery methods (e.g., information, demonstration, or practice-based), and content (e.g., KSAs) are combined. A detailed description of different team training strategies is beyond the scope of this article; however, we refer the reader to external sources.[4,7,10–13]

Table 1
The ''Big Five'' and Coordinating Mechanisms of Teamwork

Team Competency	Definition
Team leadership	The ability to direct and coordinate the activities of other team members, assess team performance, develop team knowledge, skills, and abilities, motivate team members, plan and organize, and establish a positive atmosphere. It can refer to a single team leader and to all team members if situational leadership is appropriate.
Mutual performance monitoring	The ability to apply appropriate task strategies to develop common understandings of the team environment. This includes an understanding of team mate workload, fatigue, stress, skills, and the environment external to the team itself.
Backup behavior	A person's ability to anticipate other team members' needs through knowledge about their responsibilities.
Adaptability	The ability to adjust team strategies and alter the course of action based on information gathered from the environment through the use of backup behavior and reallocation of intrateam resources.
Team orientation	An attitude characterized by a propensity to take other's behavior and input into account during group interaction and the belief in the importance of team goal's over individual members' goals.
Shared mental models	The shared understanding that team members hold.
Mutual trust	The shared belief that team members will perform their roles and protect the interests of their teammates.
Closed-loop communication	The exchange of information between a sender and a receiver.

Adapted from Salas et al.[8]

Team Building

Team building is a popular team development activity related to team training that comes in many forms. It often includes outdoor activities (e.g., ropes courses), but perhaps more frequently consists of group process discussions conducted in offices and meeting rooms. Originally designed as a group process intervention for improving interpersonal relations and social interactions, team building has evolved to also include a concern for achieving results, meeting goals, and accomplishing tasks.[14,15] According to Schein,[16,17] process intervention activities are designed to assist individuals and groups to examine, diagnose, and act upon their behavior and interpersonal relationships. The ideal end result of these activities is improved team attitudes and effectiveness.[18]

QUANTITATIVE REVIEWS

The articles reviewed here are findings from three separate meta-analyses: two[6,19] on team training interventions and one on team building interventions.[20] We direct the reader to Tables 2 through 5 for specific statistical findings that resulted from these meta-analyses. We provide here only some of the highlights of their work.

Team Building

Team building is a team intervention consisting of four components: 1) goal-setting, 2) interpersonal relations, 3) role clarification, and 4) problem solving. Klein and colleagues[20] reviewed the empirical literature conducted on team building interventions. What resulted was a thorough analysis of 20 studies and 60 effect sizes, demonstrating that team building had a moderate effect on team outcomes. A team building intervention was most effective when a team's performance was measured with affective outcomes (i.e., measures of trust, confidence in team members, attitudes) and process outcomes (i.e., coordination, communication, adaptability). The effectiveness of a team building intervention was also found to be moderated by the team building component that was being trained. For example, the effect size for the moderating effect of team building components ranged from $\rho = 0.24$ to $\rho = 0.37$, with the goal setting component resulting in the largest effect size.

Team building is effective for improving team outcomes (i.e., cognitive, affective, process, and performance). There is a positive relationship between team building as an intervention and team functioning. Most importantly, these analyses demonstrate that team building not only helps improve interpersonal conflicts within a team, but also helps process improvements, as indicated by the finding that both affective and process outcomes resulted in the highest effect size, $\rho = 0.44$. When evaluating the various components of team building, goal setting accounted for the most variance in team functioning (14%). In summary, team building is effective for various team outcomes and improving team functioning.

Table 2
Team Building Meta-analysis Results

	ρ	% Variance Accounted For
Outcome Type		
Cognitive outcomes	0.13	1.2
Affective outcomes	0.44	19.4
Process outcomes	0.44	19.4
Performance outcomes	0.26	6.8
All outcomes combined	0.31	9.6
Teambuilding component		
Goal setting	0.37	13.7
Interpersonal relations	0.26	6.8
Problem solving	0.24	5.8
Role clarification	0.35	12.3

Adapted from DiazGranados et al.[20]

Table 3
Team Training Meta-analyses Results by Training Content

Outcome Type	Training Content % Variance Accounted For		
	Task work	Teamwork	Mixed
Cognitive	9.0 (ρ = 0.30)	30.3 (ρ = 0.55)	22.0 (ρ = 0.48)
Affective	1.2 (ρ = 0.11)	17.6 (ρ = 0.42)	13.0 (ρ = 0.36)
Process	8.4 (ρ = 0.29)	21.2 (ρ = 0.46)	27.0 (ρ = 0.52)
Performance	14.4 (ρ = 0.38)	15.2 (ρ = 0.39)	13.7 (ρ = 0.37)

Adapted from Klein et al.[19]

Table 4
Team Training Meta-analyses Results

	ρ	% Variance Accounted For
Outcome type		
Cognitive	0.41	16.8
Affective	0.35	12.3
Process	0.44	19.4
Performance	0.37	13.7
All outcomes combined	0.38	14.4
Membership stability		
Intact	0.54	29.2
Ad hoc	0.34	11.6
Team size*		
Small	0.31	9.6
Medium	0.37	13.7
Large–performance	0.49	24.0

Adapted from Klein et al.[19]
*Small teams n = two members. Medium size teams 2 < n < 5. Large teams n ≥ 5.

Team Training

In a comprehensive meta-analytic review of team training strategies, Klein and colleagues[19] focused on all types of team training (e.g., cross-training, crew resource management [CRM]), excluding team building. Their meta-analysis included 41 studies and 84 effect sizes, which represented 2,502 teams. The results indicated that team training was effective for improving team outcomes and was moderated by the measured outcome type. Moderate to large effect sizes were

Table 5
Team Training Meta-analysis Results from Salas et al.[6]

	Team Training Component			
Outcome	Cross Training	Team Coordination and Adaptation Training	Guided Team Self-correction Training	Overall
Performance ($\bar{r}$)	−0.09 (ns)	0.45 ($p < 0.05$), accounted for 20% of variance	0.61 ($p < 0.05$), accounted for 37.2% of variance	0.29 ($p < 0.001$), accounted for 8.4% of variance
Objective performance ($\bar{r}$)	—	—	—	0.28 ($p < 0.001$), accounted for 8% of variance
Subjective performance ($\bar{r}$)	—	—	—	0.34 ($p < 0.001$), accounted for 12% of variance

calculated for cognitive, affective, process, and performance outcomes, and team training had a moderate and positive effect on team functioning ($\rho = 0.38$), accounting for 14% of the variance. Klein and colleagues also examined the training content of the intervention. More specifically, they considered whether a training intervention that included only either *task work-* or *teamwork*-related content impacted team outcomes differently. When the content of the team training intervention contained teamwork, task work, or combined components, the effect on team performance was similarly positive, thus improving team performance.

A more directed review conducted by Salas and colleagues[6] examined three specific team training strategies: cross-training, team coordination and adaptation training, and guided team self-correction training. Their analyses were conducted using 7 studies and 28 effect sizes. Their results indicated that across the three training strategies, team performance did in fact improve. Moreover, performance that was rated both objectively and subjectively improved, although team coordination and adaptation training, and guided self-correction training, both had larger effects on performance than cross-training.

In sum, team training works. Team training interventions are a viable approach health care teams can use to enhance team outcomes. Based on available evidence, team training accounts for a significant amount of variance in team performance, and team training interventions have a moderately positive effect on improving team outcomes. Fourteen percent of the variance in the outcomes was due to the team training intervention, and team training interventions accounted for 19.4% of the variance when examining process outcomes (i.e., coordination, communication, cooperation).When referring to human behavior, this amount of variance should not be dismissed, especially when the behavior in question is life-saving. If team training can improve any portion of team outcomes or improve processes that can lead to reduced errors or patient fatalities, it merits consideration.

QUALITATIVE REVIEW

To provide some insight into the questions of why, how, and when team training works, we conducted a qualitative review and content analysis of the health care–related team training literature. Specifically, we examined such factors as how team training programs have been designed, the content included, and the instructional methods utilized, as well as information regarding how the training program was implemented and evaluated.

Literature Search

To conduct the most comprehensive search on team training, we searched electronic databases, abstracting services, and proceedings of *Google Scholar*, Science Direct, EBSCOhost, Academic Search Premier, Business Source Premier, PsychINFO, PsycARTICLES, PubMED, and MEDLINE for articles published through February 2008. A targeted electronic search of the following journals was then conducted: Joint Commission Journal on Quality & Patient Safety and Quality and Safety in Healthcare. Using multiple combinations of appropriate words to reflect team training (e.g., teams, training, cross-training, TeamSTEPPS, crew resource management; please query authors for a full list), the search of electronic databases resulted in over 400 empirical articles on team training. Article abstracts and titles were reviewed to determine relevance. Seemingly applicable articles were retrieved and reviewed in detail to ensure relevance. To narrow the focus to empirical studies conducted with health care teams, two doctoral students reviewed the articles and coded each article by identifying the nature of the participant sample (e.g., military, aviation, medical, business, and student). Forty-four articles met the criteria for inclusion in the final database of the qualitative review and content analysis.

Coding Procedure

A detailed coding framework was established to extract key elements from each article. The coding strategy included capturing 50 pieces of information from each study. A sample of these categories include background information (e.g., author, setting, study design, description of organization, description of trainees, types of teams trained, average team size), training design (e.g., need analysis, who designed and delivered training, whether trainees/employees gave input into training design, training location), the components and features of training (e.g. training strategy,

content, duration, instructional methodologies), training evaluation and outcomes (e.g., were trainee reactions, knowledge gains, changes in behavior on the job, or organizational outcomes evaluated?), and lessons learned/guidelines.

Although these studies were empirical, we were most interested in delving deeper, past the evaluation and outcomes reported numerically, into the training design, content, and instructional techniques. Evaluations of these articles indicated success at some level, being received positively by trainees, resulting in changes in knowledge, enhancing behavior on the job, and/or positively impacting patient outcomes. Based on the results of the content review, presented are the prevalent themes used to create effective health care team training programs. These principles help to answer the questions of why, how, and when team training is effective.

Content Analysis Procedure

Content analysis is a method for analyzing text data.[21] It affords an opportunity to generate categories, themes, and patterns from articles. The goal of content analysis is to provide knowledge and understanding of the phenomenon under study.[22] For the purposes of this article, qualitative content analysis is defined as the method for interpreting the content found in health care–related team training articles. More specifically, it is the interpretation of text data contained in the relevant articles, identified by our literature search on training facets, resulting in desired outcomes.

EIGHT CRITICAL PRINCIPLES

The results of the in-depth content analysis, aided and supported by the science of team training and team performance, are summarized below in the form of eight principles critical for team training in health care. These principles are important to consider before, during, and after training.

Principle 1: Identify Critical Teamwork Competencies . . . Use These as a Focus for Training Content

To lay a foundation for optimized learning, precise learning outcomes and content must be defined to capture core targeted team competencies. Teamwork is a complex process with many relevant KSAs. Teamwork focuses on leadership, mutual performance monitoring, backup behavior, adaptability, and team orientation. Training programs such as crew resource management (CRM), team-building, and cross-training are built upon these competencies. In health care, the majority of team training programs have adopted the principles of CRM.

In our qualitative review, 81% (n = 21) of the 26 studies that explicitly identified their training strategy and teamwork competencies indicated that their training program was based upon CRM concepts. The key concepts of CRM and medically related derivatives such as ACRM and ERCRM include those related to the ''big five'' of teamwork, as well as competencies related to communication, use of all available resources, and attitudes regarding errors. Additionally, 11% (n = 3) indicated that they utilized team-building strategies. Other training strategies utilized in the reviewed studies included cross-training, where competencies include knowledge of the roles and responsibilities of other team members, and goal-setting.

Principle 2: Emphasize Teamwork over Task Work, Design for Teamwork to Improve Team Processes

Both teamwork and task work are components of team performance. However, teamwork is most associated with team processes (i.e., communication, coordination, collaboration). When time and availability for training are scarce, there is a tendency to include elements of both task work and teamwork into training sessions (e.g., train a new clinical technique, but also throw in some teamwork ''stuff''), presuming that more is better. However, the most effective team training programs that improve team processes focus on teamwork. The qualitative review found that 57% (n = 25) of the studies focused exclusively on teamwork, and 16% (n = 7) trained on a combination of teamwork and task work competencies. For example, Reznek and colleagues[23] implemented a CRM-based team training coined ''ERCRM'' in a sample of their emergency medicine residents. During the training session, the residents participated in a didactic training session that introduced them to CRM principles via lecture and discussion, viewed video demonstrations of the teamwork principles, and practiced implementing them in a simulation-based scenario. Although the simulation required trainees to apply their task-related knowledge to provide patient care, the simulation was not focused on teaching new clinical or technical skills. Rather, simulation was an opportunity for residents to practice newly learned teamwork competencies in an environment that closely mirrors their daily working environment, yet allows them to try new strategies without potentially severe consequences.

Principle 3: One Size Does Not Fit All . . . Let the Team-based Learning Outcomes Desired, and Organizational Resources, Guide the Process

Team training does not come in a box that you simply unwrap and hand out. Effective team training is guided by educational science; that is, it utilizes sound instructional principles, planning, follow-up, and an environment conducive to transfer of the new KSAs to the actual job environment. Training is not just a ''place'' where individuals go, an event that happens on one day, or a simulation exercise by itself.[10] Furthermore, teamwork is more than knowledge; it also includes behavior and attitudes. Therefore, team training must include more than conveying knowledge. In the qualitative review, 59% (n = 26) of studies explicitly indicated that they utilized a mix of traditional informational methods of instruction (e.g., lecture/classroom), modeling/demonstration, and practice or simulation. Most began with a didactic classroom based lecture/discussion/video-based session and then allowed time for either simulation or role-play of new skills. In 39% (n = 17) of the qualitatively reviewed articles, training was kept to 1 day, ranging from 30 minutes to 8 hours. Twenty percent (n = 9) trained for more than 1 day, ranging from 2 days to several months.

Principle 4: Task Exposure Is Not Enough . . . Provide Guided, Hands-on Practice

Team training must also be more than lecture-based classroom instruction. Effective team training also entails guided, hands-on practice. Learning opportunities must be guided. Simply exposing the trainee to a scenario or a task does not guarantee learning. In the qualitative review, 59% (n = 26) of the studies incorporated opportunities for practice. Of these, 62% (n = 16) utilized a high-fidelity simulator, while 23% (n = 6) utilized role-playing. Similar to simulation and standardized patients, role-playing allows participants to experience the same cognitive and behavioral processes that they will utilize on the job; however, it is conducted in a contrived environment.

Principle 5: The Power of Simulation . . . Ensure Training Relevance to Transfer Environment

Effective training creates an environment in which trainees go through the same mental processes they will utilize on the job. There needs to be a salient connection between the training content and how it can be used on the job. Simulation-based training (SBT) offers opportunities for trainees to implement and practice these new skills in environments similar to what they will experience on the job. Twenty-three (52%) of the studies in our qualitative review incorporated simulation into their training. Of these, 70% (n = 16) utilized high-fidelity simulators, such as advanced mannequin simulators. While these simulators offer the opportunity to work with advanced mannequins in environments that closely mirror the working environment (e.g., a simulated operating room), high fidelity is not always necessary for effective training.[24] Other industries have heavily utilized low-fidelity simulations that are computer-based (e.g., aviation), and such simulations are becoming more widely available in health care. The key to effective use of any SBT is to create realistic scenarios that trainees will or could potentially encounter on the job. Salas and colleagues[25] offer more extensive coverage of the elements vital to creating effective SBT.

Principle 6: Feedback Matters . . . It Must Be Descriptive, Timely, and Relevant

The training literature indicates empirical evidence for the positive impact of well-designed and executed feedback on training outcomes.[26] Feedback can include both outcome-based (e.g., did the simulated patient survive?) and behavior-based information (e.g., did the trainees communicate, coordinate, and cooperate well?). In their seminal meta-analysis and review paper regarding feedback, Kluger and DeNisi[27] state that effective feedback 1) pertains to familiar tasks and addresses task-specific goals, 2) avoids a focus on the self, and 3) addresses changes in performance from previous trials. From our qualitative review, 39% (n = 17) explicitly gave feedback after practice scenarios, with 100% of these providing feedback face to face. Feedback was usually in the form of a debriefing during which trainees discussed their own performance with the help of a facilitator. Ninety-two percent (n = 11) of the 12 articles described behavior-based feedback, which helps trainees to diagnose where improvements can be made and allows them to formulate methods to improve.

Principle 7: Go Beyond Reaction Data . . . Evaluate Clinical Outcomes, Learning, and Behaviors on the Job

Training must be evaluated to measure learning outcomes and to determine program effectiveness. A methodologic approach to training evaluation should describe what happens as a result of the training. Several frameworks have been developed regarding training evaluation, the most popular being the four-level typology developed by Kirkpatrick[28] and later refined by Kraiger et al.[29] It describes four levels of evaluation: reactions (i.e., did trainees like the training, find it useful?), knowledge/learning (i.e., did trainees increase their understanding of the competencies targeted by training?), behavior (i.e., did trainees change their behavior on the job or in relevant simulations?), and results (i.e., were important outcomes impacted?).

In our qualitative review, 32% (n = 14) of the studies evaluated trainee reactions, while 43% (n = 19) evaluated training beyond the reaction level. Specifically, 5 evaluated changes in knowledge/learning/attitudes competencies targeted during training, 15 evaluated behaviors, and 3 evaluated organizational and patient outcomes. For example, DeVita and colleagues[30] measured mannequin survival rates over the course of three simulation sessions, observing a 90% improvement. The few studies that have examined outcome measures support the positive effect of team training. A recent RAND report[2] indicated support for the link between teamwork behaviors on the job and patient outcomes such as satisfaction, risk-adjusted mortality, complications, and adverse events. Therefore, although few team training evaluations have explicitly investigated the impact on clinical outcomes, the limited available evidence indicates that teamwork positively impacts patient outcomes. However, better and robust evaluations of team training are still needed.

Principle 8: Reinforce Desired Teamwork Behaviors . . . Sustain through Coaching and Performance Evaluation

In line with the notion that team training is not a 1-day event, or somewhere that trainees simply "go," the behaviors targeted during training must be reinforced on the job. Basic psychology posits that you get more of the behaviors that are acknowledged and reinforced. To promote the transfer of teamwork competencies targeted in training to the job environment, teamwork behaviors should be incorporated into coaching and mentoring sessions, as well as performance evaluation. This will sustain the behaviors over time and drive the integration of teamwork into organizational culture. Although none of the articles analyzed in our qualitative review specifically reported the effects of coaching or incorporating these behaviors into performance evaluation, the issue of lacking institutional rewards and reinforcement was recognized. For example, Cashman and colleagues[31] reported that when team training was implemented to promote a multidisciplinary approach in a community health center, team members

expressed concern regarding the perceived increases in responsibility and workload without parallel reward. In this instance, the institution did actually look into the potential of providing other educational opportunities to participating team members as a reward for their increased work. However, when this did not come to pass, team members became discouraged. Overall, organizations achieve behaviors they measure and reinforce; therefore, this is a crucial step in team training design and implementation.

CONCLUDING REMARKS

Team training works! It is a viable instructional strategy for optimizing teamwork in health care settings. The challenge to health care is to not rush into adopting a program, but to ensure its relevancy and its careful design and create a learning environment for team members. The principles we have set forth provide evidence-based guidance for the entire training life cycle, from designing, to implementation, to evaluation. Just as a team is more than the sum of its individual team members, a team training program is more than simply content delivery. Careful attention to all elements of the training design and delivery will ensure that trainees gain the necessary KSAs to be a good team member and can maximize their use of these skills on the job, thereby enhancing both their own working conditions and patient safety.

References

1. Joint Commission on Accreditation of Healthcare Organizations. Root causes for sentinel events, 2006. Available at: http://www.jointcommission.org/SentinelEvents/Statistics/. Accessed Aug 30, 2008.
2. Sorbero ME, Farley DO, Mattke S, Lovejoy S. Outcome measures for effective teamwork in inpatient care (RAND technical report TR-462-AHRQ). Arlington, VA: RAND Corporation, 2008.
3. Alonso A, Baker DP, Holtzman A, et al. Reducing medical error in the military health system: How can team training help? Hum Resour Manag Rev. 2006; 16:396–415.
4. Salas E, Burke CS, Bowers CA, Wilson KA. Team training in the skies: Does crew resource management (CRM) training work? Hum Factors. 2001; 43:641–74.
5. Salas E, Wilson KA, Burke CS, Wightman D. Does CRM training work? An update, extension, and some critical needs. Hum Factors. 2006; 48:392–412.
6. Salas E, Nichols DR, Driskell JE. Testing three team training strategies in intact teams: A meta-analysis. Small Group Res. 2007; 38:471–88.
7. Salas E, Dickinson TL, Converse SA, Tannenbaum SI. Toward an understanding of team performance and training. In: Swezey RW, Salas E (eds). Teams: Their Training and Performance. Norwood, NJ: Ablex, 1992, pp 3–29.
8. Salas E, Sims DE, Burke CS. Is there ''big five'' in teamwork? Small Group Res. 2005; 36:555–99.
9. Salas E, Sims DE, Klein C. Cooperation and teamwork at work. In: Speilberger CD (ed). Encyclopedia of Applied Psychology. San Diego, CA: Academic Press, 2004.
10. Salas E, Cannon-Bowers JA. Methods, tools, and strategies for team training. In: Quinones MA, Ehrenstein A (eds). Training for a rapidly changing workplace: Applications of psychological research. Washington, DC: APA, 1997, pp 249–80.
11. Blickensderfer EL, Cannon-Bowers JA, Salas E. Feedback and team training: Exploring the issues. In: Proceedings of the 38th Annual Meeting Human Factors and Ergonomics Society. Nashville, TN, 1994, pp 1195–9.
12. Cannon-Bowers JA, Salas E. Teamwork competencies: The interaction of team member knowledge, skills, and attitudes. In: O'Niel HF (ed). Workforce Readiness: Competencies and Assessment. Mahwah, NJ: Lawrence Erlbaum Associates, 1997, pp 151–74.
13. Cannon-Bowers JA, Salas E. Team performance and training in complex environments: Recent findings from applied research. Curr Dir Psychol Sci. 1998; 7:83–7.
14. Beer M. Organization Change and Development: A Systems View. Santa Monica, CA: Goodyear, 1980.
15. Payne V. The team-building workshop: A trainer's guide. New York: AMACOM. 2001.
16. Schein EH. Process consultation: Its role in organization development. Reading, MA: Addison-Wesley, 1969.
17. Schein EH. Process consultation revisited: Building the helping relationship. Reading, MA: Addison-Wesley, 1999.
18. Woodman RW, Sherwood JJ. Effects of team development intervention: A field experiment. J Appl Behav Sci. 1980; 16:211–27.
19. Klein C, Salas E, DiazGranados D, et al. Do team training interventions enhance valued team outcomes? A meta-analytic initiative. Paper Presented at the 23rd Annual Conference of the Society for Industrial and Organizational Psychology, San Francisco, CA, April 2008.
20. DiazGranados D, Klein C, Salas E, Le H, Burke CS, Lyons R, Goodwin GF. Does team building work? Paper presented at the 23rd Annual Conference of the Society for Industrial and Organizational Psychology, San Francisco, CA, April 2008.
21. Cavanagh S. Content analysis: concepts, methods and applications. Nurse Res. 1997; 4:5–16.
22. Downe-Wamboldt B. Content analysis: method, applications, and issues. Healthc Women Int. 1992; 13:313–21.
23. Reznek M, Smith-Coggins R, Howard S, et al. Emergency medicine crisis resource management (EMCRM): A pilot study of a simulation-based crisis management course for emergency medicine. Acad Emerg Med. 2003; 10:386–9.
24. Salas E, Wilson KA, Lazzara EH, et al. Simulation-based training for patient safety: 10 principles that matter. J Patient Saf. 2008; 4:3–8.
25. Salas E, Rosen MA, Weaver SJ, Held JD, Weissmuller JJ. Practical guidelines to performance measurement in simulation-based training. Ergon Des. 2008; in press.

26. Ellis S, Davidi I. After-event reviews: Drawing lessons from successful and failed experiences. J Appl Psychol 2005; 90:857–71.
27. Kluger AN, Denisi A. The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback theory. Psychol Bull 1996; 119:254–84.
28. Kirkpatrick DL. Evaluation of training. In: Craig RL (ed). Training and Development Handbook (2nd ed.). New York, NY: McGraw-Hill, 1996.
29. Kraiger K, Ford JK, Salas E. Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. J Appl Psychol. 1993; 78:311–28.
30. DeVita MA, Schaefer J, Lutz J, Wang H, Dongilli T. Improving medical emergency team (MET) performance using a novel curriculum and a computerized human patient simulator. Qual Saf Health Care. 2005; 14:326–31.
31. Cashman SB, Reidy P, Cody K, Lemay C. Developing and measuring progress toward collaborative, integrated, interdisciplinary health care teams. J Interprof Care. 2004; 18:183–96.