

TEAMWORK TRAINING FOR PATIENT SAFETY: BEST PRACTICES AND GUIDING PRINCIPLES

Eduardo Salas, Katherine A. Wilson-Donnelly, Dana E. Sims, C.
Shawn Burke, and Heather A. Priest
University of Central Florida, Orlando

TEAMWORK TRAINING IN HEALTH CARE: BEST PRACTICES AND GUIDING PRINCIPLES

A resident's shift started at 7 a.m. in the emergency medicine department at a large urban hospital. Around midnight the resident tried to get some rest, but a gunshot victim was rushed into the emergency room not 5 minutes later. No other time to rest presented itself during the shift. It is 5 a.m. the next morning when several victims of a car crash arrive and are severely injured. As one of the victims cries out in pain, the tired resident asks a nurse to administer the pain relieving drug Demerol without checking the patient's chart for allergies. Before administering the drug, the nurse decides to check the chart, which indicates that the patient was given Demerol when admitted to the hospital on a previous occasion that resulted in severely low blood pressure and difficulty breathing. The nurse is concerned that the same allergic reaction may occur again. However, the nurse has been previously reprimanded for questioning this doctor's order and administers the Demerol without discussing this patient's history with the doctor. As a result, the patient dies.

Who is to blame in this example? The nurse for not speaking up to the doctor? The doctor for discouraging nurses from voicing concerns? The organization for fostering a culture that has a closed

authoritarian hierarchy in which what the doctor says goes? This hypothetical situation is more realistic than we would like to think, and it is not confined to just the health care community.

Although the previous example shows how health care teams may derail, there are many times when patients' lives are saved as a result of effective teamwork. For example, a father rushes his 1-year-old son into the emergency room and tells the nurse that the child is choking on something but he can't see the object. The attending resident rushes over and attempts to ventilate. Simultaneously, a second doctor is listening for any sign of breathing. The doctor indicates that the child is breathing slightly and orders several instruments (e.g., forceps) to try and remove the object. Nurses rush to get the instruments quickly to the doctor's side. The object is severely lodged and efforts to remove it have failed, yet the team perseveres. A number of suggestions are provided by doctors and nurses of varying specialties as to how to remove the lodged object. Each of these suggestions is seen as viable, and the team tries to implement them without success. Brain damage is of concern as very little oxygen is reaching the child's system. Numerous intubation attempts are unsuccessful and the drained doctors ask for someone else to step in—this time the attempt is successful and the child begins to breathe. After some additional hard work and coordination, the object (the family cat's play toy) is removed from the child's throat. Only time

will tell if the teamwork demonstrated will allow this child to lead a normal, healthy life.

WHY SHOULD HEALTH CARE BE CONCERNED ABOUT TEAMS AND TEAMWORK TRAINING?

The hypothetical examples we provided indicate the need for teams and teamwork in health care settings. The latter example demonstrates the importance of teamwork and the reliance of team members on one another to save a patient's life. However, the former example is all too common as well, and errors can lead to catastrophic results. The health care community has for many years overlooked the role that individual and team errors have played in the field (Pietro, Shyavitz, Smith, & Auerbach, 2000). It has been estimated that at least 50% of errors are not reported, and 70% of those reported were deemed preventable (Leape, 1994). The 1999 Institute of Medicine report on medical errors (Kohn, Corrigan, & Donaldson, 1999) shed some light on this delicate subject, and greater attention is now being paid. Reasons as to why errors are ignored can be attributed to several factors. For example, the medical professional is not in any physical danger if an error is committed (e.g., there is no risk of death to the doctor if an error is committed on a patient; this is opposed to the risk of death to a pilot who makes a catastrophic error in the aircraft). Additionally, there is a risk of legal liability that could be brought against both individual health care professionals and health care organizations if errors are documented. Finally, medical errors are often justified and rationalized due to the complex and subjective nature of health care (Pietro et al., 2000).

As medical errors will continue to occur, the need for highly trained teams in health care to recognize errors and to know how to correct errors to improve patient safety is imperative. Although the health care community has long used teams that are highly trained in the technical skills needed for the job, these teams often lack knowledge of teamwork skills. It has been argued that merely requiring a group of experts to work together does not make them an expert team (e.g., Salas, Sims, Klein, & Burke, 2003). Rather, training—team training—is needed to give the team the necessary knowledge, skills, and attitudes (KSAs) to effectively communicate, collaborate, and coordinate as a team.

Therefore, the purpose of this chapter is twofold. First, we offer a brief discussion about what is known about teams, teamwork, team effectiveness, and the design and delivery of team training. A more thorough discussion of the importance of teamwork to patient safety can be found in Baker et al.'s chapter in this volume. Second, we discuss some best practices and principles that training designers, managers, and patient safety officers in health care can use to systematically guide the design, delivery, and evaluation of team training programs.

WHAT DO WE KNOW ABOUT TEAMS AND TEAMWORK?

Teams

Teams are widely used throughout the health care community (e.g., surgery, emergency medicine, fire rescue), the military, industry, and aviation. Health care teams typically consist of team members with different specialties (e.g., anesthesiology, cardiology) and different status (e.g., doctor, nurse). Indeed, all teams are not created equal. And groups are not the same as teams. Although some may think that this is an academic distinction or debate, the fact remains: there is a difference between a collection of individuals in a group and a set of interdependent team members with distributed expertise. For our purpose, we define a team as two or more individuals with specialized roles and responsibilities who must interact dynamically and interdependently and are organized hierarchically to achieve common or valued goals and objectives (Salas, Dickinson, Converse, & Tannenbaum, 1992). Groups are just a collection of individuals joined temporally, for example, to brainstorm, troubleshoot or problem-solve, or discuss an issue. Groups by in large do not have meaningful task interdependency. They may not have a past or a future. Teams do. To function effectively, (a) resources and information must be exchanged between team members; (b) task activities, actions, and events must be synchronized and coordinated; (c) team members must continually adapt to task environmental and cue demands; and (d) members must be engaged in closed-loop communication, back-up behavior, and mutual performance monitoring (Hackman, 1990; Salas et al., 2003). All these are supported by a functional team leader.

Core Components of Teamwork

Teamwork is more than getting the job done or how people interact with each other—it is the ability to create value-added outcomes through a shared understanding of the team's resources (i.e., members' KSAs), the team goals and objectives, and the constraints under which the team works. Teamwork can be conceptualized as the interactions among team members to reach shared goals and adaptation of strategies with changing environmental demands to reach those goals (Salas & Cannon-Bowers, 2000). Furthermore, effective teamwork requires a set of team competencies—cognitions (what team members think), behaviors (what team members do), and attitudes (what team members feel). Although a number of team effectiveness models have been proposed in the literature that discuss what factors promote or deter teamwork (e.g., Campion, Medsker, & Higgs, 1993; Fleishman & Zaccaro, 1992; Marks, Mathieu, & Zaccaro, 2001; Salas et al., 1992; Stevens & Campion, 1994), there is little consensus among researchers regarding teamwork and the factors that comprise it. As such, Salas, Burke, and Stagl (2004) reviewed the team literature and proposed that, at its core, teamwork is comprised of five core factors—the “Big 5 of Teamwork.” The five core components proposed are team leadership, mutual performance monitoring, back-up behavior, adaptability, and team orientation. Furthermore, three coordinating mechanisms (i.e., a shared mental model, engaging in closed-loop communication, and holding mutual trust) work around the Big 5 to ensure effective team performance. We now present a brief discussion of each core component and the corresponding coordinating mechanisms and provide examples to illustrate their relevance to the medical community. Additionally, a number of principles associated with the components of teamwork have been offered in the literature and are presented in Table 44-1.

Team leadership. Leaders make or break a team. Team leadership serves to guide and structure the team (Stewart & Manz, 1995). A clear difference should be drawn between the leadership of individuals versus team leadership. Generally one who is leading independent individuals will diagnose a problem, generate possible solutions, and implement the most appropriate solution (e.g., Fleishman et al., 1991). An example of this type of leadership

might be seen in a situation in which the leader makes all of the decisions without input from other individuals. Conversely, team leadership does not involve handing down solutions to team members but rather defining team goals, setting expectations, coordinating activities, organizing team resources, and guiding the team toward their goals (Salas et al., 2004). In this case, the goal might be the repair of heart damage and the survival of the patient. The team leader will set the expectations of how the team will meet these goals but is willing to adapt to the situation. Furthermore, the team leader creates, fosters, and maintains shared knowledge among team members, assigns tasks, assesses performance, motivates team members, promotes adaptability, and creates a positive atmosphere (Cannon-Bowers, Tannenbaum, Salas, & Volpe, 1995).

Mutual performance monitoring. The second core teamwork component is mutual performance monitoring. For a team to be effective, it is important that team members maintain an “awareness” of how others (and themselves) are functioning by monitoring each other's work while simultaneously performing their own tasks (McIntyre & Salas, 1995). The purpose of this is to (hopefully) prevent or mitigate the consequences of errors. Certainly, tasks that medical professionals face occur in complex and fast-paced environments with many opportunities for errors. Mutual performance monitoring can, thus, benefit teams by allowing errors or lapses to be caught earlier in their sequence and before they transpire into larger, more catastrophic errors. Thinking back to the first example provided in this chapter: The nurse caught the doctor's error by checking the patient's chart for him. However, due to a lack of teamwork skills (e.g., assertiveness by the nurse, leadership by the doctor), the error was not stopped and deadly consequences occurred.

Probably one of the most high profile cases of medical error involved Willie King in 1995 in Tampa, Florida. Mr. King's left leg was amputated instead of his right. Although much of the media attention focused on the error of the attending surgeon and the subsequent suspension of the doctor's license, medical experts testified that failures within the hospital information management records and errors by other hospital employees played a large part in the ultimate occurrence of the error (Crane, 1997). Specifically, some team

TABLE 44-1. Teamwork Principles

General Principles

- Teamwork and taskwork are different components of team performance.
- Teamwork is affected by a number of external and internal factors.
- Effective teamwork requires that team members amass competencies for their specific team task before receiving team training.
- There are a number of teamwork skills that are nonexclusive (generic).
- Teams that are motivated, and think about their efficacy, will "stretch" themselves to attain what an individual would not contemplate as possible.
- Effective teams optimize resources.
- Teams develop and transform over time.
- "Mature" teams are composed of members who can foresee one another's needs.
- "Mature" teams depend less on overt communication to perform effectively.
- Teamwork is depicted as a set of behavioral skills that are suited to situational demands.

Team Leadership-Related Principles

- Team performance is influenced by team leadership.
- Team leaders can be used as models of teamwork.
- Teamwork involves active participation by the team leader and its teammates.
- Effective team leaders are respected by team members.
- Team leaders have different experience levels in team operations and various readiness levels to lead a team.
- Effective team leaders are knowledgeable in their specialty areas and accept suggestions of other team members who are experts in a special area.
- Team leaders clearly define social structure, encourage open communications, and exhibit self-disclosure to develop team cohesion.
- Leaders should clearly define and encourage team goals and performance expectations to promote commitment and consensus on team climate.
- Team coherence is moderated by team leader actions within the task-contingent role.
- Effective team leaders plan, structure, and coordinate the team.
- Effective team leaders exhibit more initiating structure behavior as the number of team members increases.
- Team leaders maintain the team members' focus on their task.
- Team leaders use effective communications. They inform the team about matters that affect team performance.
- One of the functions of the team leader is to provide feedback.
- A team leader's style affects the degree of successful feedback provided to the team.
- Effective leaders develop coherent teams.
- Leaders adjust their role to match the team's progress.
- The leader must define, clarify, and instill team goals and objectives early during team formation.

Performance Monitoring and Back Up-Related Principles

- Teamwork involves members overseeing one another's performance.
- Teamwork involves members exchanging and accepting feedback from one another.
- Teamwork involves being willing, prepared, and inclined to back up teammates during performance.
- Teamwork involves "intermember reinforcement" behaviors, for example teammates thanking one another for correcting mistakes and complimenting one another for performing a task well. These behaviors seem to encourage a feeling of task competency among teammates and to some extent decrease the perception of a formal hierarchy that exists between team leaders and its members.

Adaptability-Related Principles

- Team members should be adept at adjusting crucial information to the task being performed.
- Team members that are versatile can vary the way they perform a task when needed or when requested to do so.
- Team members that are versatile can provide information on how to identify and correct mistakes.

Team Orientation-Related Principles

- Effective teams exhibit a strong feeling of "teamness".
- Team members value and accept the input of others.
- Team members enhance individual performance through the coordination, evaluation, and utilization of task inputs from other group members while performing group tasks.

Shared Mental Models-Related Principles

- Effective teams share a similar understanding and representation of team goals, individual team member tasks, and how the team will coordinate to achieve their common goals.
- Team members share team-related and task-related mental models.
- Effective teams do not require the sharing of an exact mental model, but rather a similar, slightly overlapping mental model.

TABLE 44-1. (Continued)

Communication-Related Principles

- Team members need to convey information to other members using the appropriate terminology.
- Team members need to convey information to other members in the appropriate order.
- Effective teams have team members who complement one another's accomplishments.
- Effective teamwork entails members exchanging information that usually include closed-loop communication.
- The effectiveness of new communication tools (e.g., e-mail) depends on the structure of the team.
- On some occasions more communication among team members can lead to effective performance and at other times it will hinder performance, depending on the team structure operating at that time.

Mutual Trust-Related Principles

- Team members share the perception that individual team members will perform their tasks.
- Effective teams are more willing to accept a certain amount of risk by relying on team members to reach their goals.
- Team members accept team leadership behaviors.

Interpersonal Relations-Related Principles

- Teammates encourage one another when they make errors.
- Teammates who perceive themselves as integral to the team's accomplishments feel more satisfied than those who do not perceive themselves this way.
- Successful team motivation and performance are related to team members making positive comments and complimenting one another.
- Teamwork means encouraging an attitude of interdependence, so that members recognize that the team's success depends on their interaction.

Coordination/Cooperation-Related Principles

- Effective teams exhibit "intermember assistance" behaviors, such as prompting and behaviors that indicate task coordination. This component is characterized by conduct such as prompting and guiding others on the next action to be taken.
- Team cooperation can be characterized as team members checking with one another when unclear about what to do next.
- Teams that are well coordinated tend to be successful. Team members of effectively coordinated teams can shift easily from one task to another when necessary for task completion.
- Team cooperation can be characterized as team members assisting one another to perform a task when such tasks are not part of the teammate's actual responsibility.
- Well-coordinated team members that are unoccupied seek to learn about other teammates' responsibilities and assist them when necessary.
- Successful team members coordinate with one another to collect information in a systematic manner.
- Successful team members tend to assist other teammates who are experiencing difficulties with a task.
- Successful team performance is related to team members asking for assistance when needed.

members were not included in the verification process, and others did not feel they were allowed to call attention to the error (Joint Commission Resources, 1998). Mutual performance monitoring, which promotes team members in providing, seeking, and receiving feedback related to the task (Salas & Cannon-Bowers, 2000), might have ameliorated the error. Critical to the success of mutual performance monitoring is the support of the team leader (who will foster the shared understanding of the tasks) and also a sense that the feedback that may result from mutual performance monitoring is valuable.

Back-up behavior. If team members engage in mutual performance monitoring, then they can provide back-up behavior(s). They can step in to help. If

when monitoring another team member's performance a decrement is detected or expected (e.g., due to high workload), it is the responsibility of that team member to provide the other member with support or assistance (i.e., backup). Thus, back-up behavior can be defined as a team member's ability to provide resources and task-related assistance to others in times when performance may decline (Porter et al., 2003). Back-up behavior can serve one of three purposes: (a) provide feedback to improve performance, (b) assist in performing a task, and (c) complete a task for another (Marks et al., 2001). Returning to the example presented earlier in which a tired and overloaded resident committed a medication error, mutual performance monitoring and back-up behavior may have prevented this error. McIntyre and Salas (1995) argued that the ability to provide back-up behavior to team members

separates a team from a group of individuals who happen to be working colocated.

Adaptability. If team members can provide back-up behavior, then they can adapt. The ability of a team member to monitor another's performance, assist in performing a task, and accept feedback and alter their behaviors appropriately is important to team effectiveness as it demonstrates adaptability (Campion, Medsker, & Higgs, 1993). Although this type of adaptability is at the individual level, the team as a whole must also adapt at times due to changes in the environment or task situation. Adaptability can, therefore, be defined as the ability of the team or individual team members to adjust their strategies based on information gathered from the task environment through flexibility, compensatory behaviors, and reallocation of resources (Salas & Cannon-Bowers, 2000). Because many teams, such as those in health care, operate in a dynamic and stressful environment, the ability of teams to adapt to changing situations is imperative.

The team's operational need for team adaptation is driven both by the complexity of the environments that many teams operate within (i.e., things don't always go as planned) as well as by the interdependent nature of such teams. A vivid example might be easily envisioned in the emergency room. Imagine a team of medical professionals working on a patient with symptoms of an anxiety attack (e.g., dizziness, difficulty breathing, and chest pain). As the treatment progresses, the patient's condition worsens and the team realizes that in fact the patient is experiencing a heart attack. It is, thus, the responsibility of the team to notice the changing medical condition (e.g., nonresponse to traditional anxiety treatment), assign meaning to that change (i.e., heart attack), and finally to develop and successfully carry out a new plan of treatment (i.e., adjust their strategies) while still coordinating. If any step within this process is skipped or breaks down, the patient's chance of survival deteriorates.

Team orientation. The final component essential to teamwork is team orientation. Although the previous dimensions have been behavioral in nature, team orientation is attitudinal. It is a disposition. Team orientation involves not only a preference for working with others but also the tendency to enhance individual performance through the coordination, evaluation, and utilization of task inputs from other members while performing

group tasks (Driskell & Salas, 1992). Team orientation is important not only because it improves individual effort and performance within a team (Shamir, 1990), but it has also been found to facilitate overall team performance (e.g., better decision making; Driskell & Salas, 1992). Specifically, team orientation results in increased cooperation and coordination among team members (Eby & Dobbins, 1997), which facilitates increased task involvement, information sharing, strategizing, and goal setting. For instance, Driskell and Salas found that individuals with a team orientation more frequently considered teammate input, even if the input was not always accepted as correct. Team orientation also increased the likelihood of uncovering errors, and the resultant reevaluation of the team product led to higher quality decisions.

In the medical setting, team orientation requires team members to accept and consider the input from others who have knowledge of a particular patient, regardless of status or rank. For example, it is important that doctors and nurses consider each other as members of the same team and therefore recognize the need to share relevant information regarding the patient. We would argue that those with a team orientation would be more likely to share and accept this information.

Coordinating Mechanisms of Teamwork

As noted, having the core components of teamwork is not enough, as teams also require that several coordinating mechanisms operate to produce effective teamwork. Although very little of the literature accurately addresses how these mechanisms are created, we believe that these coordinating concepts are best described as "mechanisms," because they are a process for achieving the goal of teamwork. Although there is still a great deal we do not understand about implementing and validating such concepts (e.g., shared mental models), effective teams are able to develop these mechanisms and coordinate effectively. We next discuss these mechanisms, specifically shared mental models, closed-loop communication, and mutual trust.

Shared mental models. For teamwork to be successful, especially under stress, it is important that team members anticipate and predict the needs of others. This is accomplished through a common understanding of the team's goals and expectations

individual team member tasks and task environment, and the method(s) by which the team will coordinate to achieve their goals (i.e., shared mental models; Cannon-Bowers, Salas, Tannenbaum, & Mathieu, 1995). There are two types of mental models discussed in the literature: team related and task related (e.g., Mathieu, Heffner, Goodwin, Salas, & Cannon-Bowers, 2000). Team-related mental models deal with information pertaining to team functioning and expected behaviors. On the other hand, task-related mental models relate to information dealing with the materials (e.g., equipment) required to complete the task and how to use the materials. Relating to the core components of teamwork, shared mental models should allow for more and better mutual performance monitoring and back-up behavior because team members will have a shared understanding about each other's tasks and what is expected of them. Research supports this. For example, some research suggests that shared mental models lead to more effective communication, improved performance (e.g., Griepentrog & Fleming, 2003; Mohammed, Klimoski, & Rentsch, 2000; Stout, Salas, & Fowlkes, 1997), and willingness of team members to work with others in the future (Rentsch & Klimoski, 2001).

Closed-loop communication. Communication is important in the workplace as well as socially, as this allows us to exchange information that is relevant to a given situation. Health care teams communicate every day—whether it be nurses exchanging information during a shift change, emergency medical technicians providing an incoming patient's stats to emergency department personnel, or a nurse updating a doctor on a patient's status. However, research suggests that team members often interpret the same information in different ways due to differing perspectives and biases (Bandow, 2001). Therefore, effective teamwork requires more than just sending and receiving information. It requires closed-loop communication. Closed-loop communication is the process of sending information, acknowledging receipt of that information, and ensuring the proper understanding of that information (Cannon-Bowers et al., 1995). Without closed-loop communication, the chance of team members misunderstanding the information being shared increases, leading to errors. This is especially important in health care due to the dynamic and complex nature of the environment in which the consequences for errors are high.

Mutual trust. The final coordinating mechanism essential for effective teamwork is mutual trust.

Mutual trust is defined as the shared perceptions that team members will perform the necessary actions to complete their task and respect the rights and interests of team members (Webber, 2002). A lack of trust among team members can result in wasted time and energy protecting, checking on, and inspecting other team members (Cooper & Sawaf, 1996). Research suggests that mutual trust in teams leads to improved participation and contribution, better quality of products, decreased cycle times, and retention of team members (Bandow, 2001). In the health care community, doctors (for example) rely heavily on nurses to assist them with a patient. It is important that the doctor trust that the nurse will do the job effectively, so the doctor does not feel the need to direct the nurse to perform certain tasks. Without trust, teamwork will be hindered.

The Big 5 of Teamwork that we proposed are indeed teamwork competencies. That is, training that is well designed, is focused on teamwork, and provides opportunities to practice and get feedback will provide team members (and the teams) with a required behavioral repertoire to perform effectively. We discuss the design and delivery of team training next.

WHAT DO WE KNOW ABOUT TEAM TRAINING?

The teamwork core competencies and coordinating mechanisms discussed in the previous section do not generally come naturally to team members. Rather, they must be trained. Hopefully, the design of the training will be guided from what is known about the science of training and learning (Salas & Cannon-Bowers, 2001, 2000). Team training can be defined as the systematic acquisition of KSAs that lead to improved performance and safety in a specific environment (Salas et al., 1992). There are four necessary components (i.e., tools, methods, competencies, and learning objectives) that come together to shape team training strategies (Cannon-Bowers & Salas, 1998; Salas & Cannon-Bowers, 1997). Team training tools include, for example, team task analysis (see Burke, 2005), task simulation and exercises (see Salas, Wilson-Donnelly, Burke, & Priest, in press), and feedback strategies. These tools aid in collecting information needed to focus the training and structure the design, delivery, evaluation, and transfer of team training. The methods used to deliver the training are driven, of course, by the training objectives and content. There are typically three

methods used to deliver team training: information based (e.g., presentation of knowledge via lecture), demonstration based (e.g., presentation of critical events via video), and practice based (e.g., simulators; Salas & Cannon-Bowers, 2000). Taking these components together, instructional strategies focused on teamwork can be determined. Examples of team training strategies relevant to the health care community include team coordination training (also called crisis resource management [CRM] training), cross-training, assertiveness training, simulation-based training, team self-correction, and team leadership training (see Table 44-2 for definitions). These team-based instructional strategies (discussed later) facilitate the competencies necessary for effective teamwork. We should note that CRM training is not the only strategy available for developing effective teams. There are more than we note here. The health care community needs to learn more about these and use them as needed. Given what we know today about the intricacy of teams and team training, a number of guiding principles can be developed to help training designers and developers ensure the effectiveness of their team training program. We present these principles next. For a full discussion of these, see Salas and Cannon-Bowers (2001).

WHAT ARE THE BEST PRACTICES FOR DESIGNING, IMPLEMENTING, AND EVALUATING TEAMWORK TRAINING?

Up to this point we have presented a brief review of what is known about teams and team training. We now focus on how to systematically design, implement, and evaluate team training. Team training is influenced by multiple factors before, during, and following training. Each of these factors must be considered when designing and delivering training to ensure its effectiveness. This is especially critical in communities, such as health care, in which the consequences for errors due to a lack of team performance can be catastrophic. As such, there are a number of guiding principles that training designers and developers should follow when implementing a team training program. We present these principles next.

Best Practices for Designing Team Training (and Teams)

Best Practice 1. Health care organizations should conduct a team task analysis to determine the coordination

demands, as well as the requirements for the design of team training.

Glickman and colleagues (1987) have argued that both taskwork (i.e., task-oriented skills) and teamwork skills (i.e., behavioral, attitudinal, and cognitive responses needed to coordinate with fellow team members) are needed for teams to successfully complete their tasks. As such, some researchers have developed and refined the procedure known as team task analysis as a means to identify taskwork and teamwork skills (Bowers, Baker, & Salas, 1994; Bowers, Morgan, Salas, & Prince, 1993; McNeese & Rentsch, 2001).

There are seven key steps to conducting a team task analysis (see Burke, 2004, for a complete discussion of conducting team task analysis; see also Table 44-3). The first step involves conducting a requirements analysis in which the target job is identified, the associated duties and conditions under which the job is to be performed are clarified, information-gathering methods are identified (e.g., observation, questionnaires; Goldstein, 1993), the team task analysis protocol is developed, and subject matter experts are contacted for participation. The next step is to identify the tasks that comprise the target job through subject matter expert interviews (Goldstein, 1993) and to write statements describing the work, what the worker does and how, to whom, and why it is done (Goldstein & Ford, 2002). The purpose of Step 3 is to identify a teamwork taxonomy (e.g., Fleishman & Zaccaro, 1992; Stevens & Campion, 1999) so that tasks relating to taskwork can be distinguished from those relating to teamwork. Step 4 involves conducting a coordination analysis to determine which tasks require team members to coordinate activities to complete their tasks. This information is typically determined using surveys and cluster analyses (e.g., Bowers et al., 1993). Fifth, once the teamwork and taskwork tasks have been identified, it is necessary to determine which of these tasks are most relevant by asking subject matter experts to rate the tasks. The sixth step requires the translation of tasks into KSAs and abilities (see Goldstein & Ford, 2002) by subject matter experts. Finally, the competencies identified in Step 6 must be linked to each of the team tasks by stating whether they are essential, helpful, or not relevant.

Best Practice 2. Health care organizations should consider early on the factors external to the training program that may influence its success.

When designing a team training program (or any training program for that matter), it is necessary to consider factors external to the training program that will influence its success over and above the

TABLE 4-2. Team-based Instructional Strategies Relevant in Health Care

Strategy	Definition	Tools	Methods	Sources
Team coordination training	Improves team coordination communication (both explicit and implicit) encourages backup behavior, and provides practice, opportunities for other KSAs that lead to effective coordination	Performance measures Feedback Simulations Learning principles	Information-based: Lecture Demonstration-based Video Practice-based: Guided practice	Bowers Blickensderfer & Morgan, 1998; Entin & Serfaty 1999
Cross training	Team members receive practice in performing other team members' roles and tasks. Leads to a better understanding of other team members' responsibilities and taskwork Leads to enhanced shared mental models and interpositional knowledge	Performance measures Team task analysis Learning principles Simulations Feedback	Information-based: Lecture and multimedia Demonstration-based: Role modeling Practice-based Guided practice	Salas et al., 1997, Volpe, Cannon-Bowers, Salas, & Spector, 2001
Assertiveness training	Practice and feedback help create and reinforce assertiveness in trainees. Provides opportunities for practice and supplies feedback.		Practice-based: Role play	Smith-Jentsch et al., 1996
Simulation-based training and games	Provides opportunities for trainees to operate in a realistic setting with life-like terrain, interaction, and dynamic situations. Range in fidelity, immersion, and cost. Widely used in business, the military, and research.			Marks, 2000; Tannenbaum & Yuki, 1992
Team self-correction training	Helps individuals correct and evaluate their own behavior to assess the effectiveness of the behavior. Team members learn to assess other team members. Allows constructive feedback and correction of discrepancies	Team task analysis Performance measures Learning principles Feedback	Practice-based: Role play	Blickensderfer et al., 1997a; Smith-Jentsch et al., 1998
Team leadership training		Team task analysis Performance measures Feedback Simulations	Information-based: Lecture and seminar/ workshop Demonstration-based: Video Practice-based: Guided practices and behavior modeling	

Note. KSA = Knowledge, skills, and attitudes.

TABLE 44-3. Steps for Conducting a Team Task Analysis

1. Conduct a requirements analysis.
 - What is the target job?
 - What are the duties and conditions under which the team has to perform?
 - What knowledge gathering methodologies will be used?
 - What is the protocol for conducting the team task analysis?
 - What subject matter experts will be used throughout the team task analysis?
2. Identify the tasks that comprise the target job.
 - What tasks do the teams perform on the job?
3. Task description.
 - How is the task described?
 - What are the task characteristics?
 - What are the task requirements?
 - What does the team do?
 - How does the team do it?
 - To whom/what and why does the team do it?
 - What are the task competencies?
 - What knowledge (e.g., declarative, procedural) is necessary?
 - What skills are necessary?
 - What cognitive abilities are necessary?
 - What attitudes are necessary?
 - How are tasks prioritized?
4. Determine relevant taskwork and teamwork tasks.
 - What are the most relevant tasks?
 - Which tasks can be clustered together?
 - Have subject-matter experts been consulted to help with clustering?
5. Identify teamwork taxonomy.
 - What tasks can be categorized as taskwork related?
 - What tasks can be categorized as teamwork related?
 - What teamwork taxonomy will be used?
6. Conduct a coordination analysis.
 - Which tasks place a requirement on the team to coordinate activities?
7. Translate tasks into KSAs.
 - What are the requisite knowledge, skills, abilities, and attitudes related to the relevant tasks?
8. Link KSAs to team tasks.
 - Which KSAs are essential, helpful, or not relevant to the task?

Note. KSAs = knowledge, skills, and attitude.

content and strategies used. We discuss several factors that we believe will influence team training programs in health care, specifically, the pretraining environment, organizational and individual characteristics, and trainee motivation.

Best Practice 2a. A pretraining environment should be created that prepares trainees for team training.

A key factor influencing a training program's success is the pretraining environment. There are two main characteristics of the pretraining environment that need to be considered: (a) prepractice conditions and (b) pretraining climate (Salas & Cannon-Bowers, 2001). First, prepractice conditions are elements in the pretraining environment

whose purpose is to help prepare trainees for practice exercises during training. Because practice is more than the mere repetition of a task and is rather a complex process that leads to skill acquisition (Ehrenstein, Walker, Czerwinski, & Feldman, 1997; Shute & Gawlick, 1995), providing trainees with preparatory information and advanced organizers have been suggested as interventions that can help trainees to better prepare for practice sessions (Cannon-Bowers, Burns, Salas, & Pruitt, 1998).

In addition to prepractice conditions, the pretraining climate will also impact the outcomes of team training. Specifically, how the training is

trained (i.e., remedial vs. advanced) will influence trainees' motivation and learning (Quinones, 1995, 1997). Additionally, the training's attendance policy (i.e., voluntary vs. mandatory) has been argued to influence the success of training (Baldwin & Magjuka, 1997). Finally, trainees' previous training experience (i.e., positive vs. negative) is thought to influence trainees' learning and retention (Smith-Jentsch, Salas, & Baker, 1996).

Best Practice 2b. The organization should support and provide the necessary resources for training.

Beyond the pretraining environment, characteristics of the organization (i.e., those present within the organization to which the newly acquired competencies must be performed) have been argued to influence the outcomes of training. Specifically, situational constraints, such as improper equipment, can lead to less than ideal training outcomes. Additionally, the organizational climate (e.g., perceived organizational support, safety culture and policies) has been suggested as having a direct impact on the outcomes of training (e.g., Rouiller & Goldstein, 1993; Tracey, Tannenbaum, & Kavanagh, 1995). In other words, for training to be more successful, it is important that the organization's goals support the training, the climate (i.e., management support) encourages demonstration of the trained competencies, and the organization provides the necessary resources to do this (Goldstein, 1993).

Best Practice 2c. Characteristics of the trainees should be considered when designing training.

In addition to the pretraining environment and organizational characteristics, training outcomes are influenced by characteristics that trainees bring to the training program. Individual characteristics suggested to influence the success of training are trainees' cognitive abilities (i.e., general intelligence, or "g"), self-efficacy (i.e., belief in own ability), expectations, and goal orientation (i.e., mastery vs. performance). First, research has shown that cognitive ability influences trainees' attainment of knowledge about the job (see Colquitt, LePine, & Noe, 2000; Ree, Carretta, & Teachout, 1995) and is a strong determinant of success in training (Ree & Earles, 1991). Next, trainees' self-efficacy has been shown to lead to better performance (see Ford, Kozlowski, Kraiger, Salas, & Teachout, 1997; Martocchio & Webster, 1992; Quinones, 1995) and is influenced by cognitive ability (see Hunter, 1986). Trainees' expectations regarding training has also been a factor influencing the success of training, and some research has indicated that when trainees' expectations are met, they demonstrate more

commitment to transferring the learned competencies and improved self-efficacy (Tannenbaum, Mathieu, Salas, & Cannon-Bowers, 1991). Finally, research suggests that trainees' goal orientation will influence training outcomes (Dweck, 1986; Dweck & Leggett, 1988). The orientation that is more successful will depend on the goals of the training. For example, individuals high in mastery orientation aim to acquire new skills and master novel situations (e.g., Ford et al., 1997; Phillips & Gully, 1997), whereas trainees high in performance orientation aim to achieve high performance ratings and to avoid negative ones (see Salas, Burke, Bowers, & Wilson, 2001; Ford, Smith, Weissbein, Gully, & Salas, 1998).

Best Practice 2d. Trainees should be motivated to attend, participate, and be engaged in the team training program.

Finally, trainee motivation, which is influenced by both individual (e.g., self-efficacy) and organizational (e.g., notification) characteristics, influence trainees' willingness to participate in and learn from the training and will, therefore, influence the outcomes of training (e.g., Baldwin, Magjuka, & Loher, 1991; Mathieu, Tannenbaum, & Salas, 1992). Training motivation will influence training in terms of the amount of time and effort invested by trainees, as well as the behaviors exhibited after training on the job (Naylor, Pritchard, & Ilgen, 1980, as cited in Goldstein, 1993). Finally, when trainees believe that the training and its outcomes are relevant to their job performance (Noc, 1986), they will be more motivated to participate and learn.

Best Practice 3. Health care organizations should avoid falling prey to the myths of training.

Despite what is known about training, there are a number of myths or misconceptions that persist regarding the design, delivery, and evaluation of such programs in organizations (Salas, Rhodenizer, & Bowers, 2000). These myths exist because training is often designed based on many unsupported assumptions about how to optimize the acquisition of skills, thus hindering training's effectiveness. We believe that the health care community may fall prey to some training myths (as many others have), diminishing the effects of its team training programs. See Table 44-4 for the relevant myths and their descriptions.

Best Practices for Implementing Team Training

Best Practice 4. Training objectives (i.e., learning outcomes) should be developed based on information obtained in the team task analysis.

TABLE 44-4. Team Training Myths and Associated Realities

Myth	Reality
Myth 1. Everyone who has ever learned anything or has gone to training is a training expert and therefore can design it	Training is a complex event involving behavioral and cognitive aspects. Designers must consider scenario design, guided practice, feedback, measurement, and supporting technology. To develop and deliver a successful training program, one must first be trained in the necessary knowledge, skills, and attitudes to do so.
Myth 2. Subject-matter experts should drive the design of training.	Subject-matter experts are a great source of task domain knowledge and can and should articulate the needs and requirements to execute a task. They are necessary but not sufficient to ensure a sound learning environment. As such, the design of team training requires a partnership between subject-matter experts and learning experts.
Myth 3. The higher the fidelity of the simulation, the better one learns.	The literature available regarding team training in health care has indicated that the community relies heavily on high fidelity simulations to train its teams. Of concern is that much of this training appears to focus more on how to use the simulation rather than the teamwork competencies being trained. It is suggested that simulations designed with low physical and functional fidelity will be as effective as those with high fidelity as long as the psychological fidelity of the system is adequate.
Myth 4. The more one practices, the better one gets.	Practice alone does not improve performance. Practice needs to be guided and requires measurement and feedback. In addition, practice should accompany training to help trainees develop appropriate mental representations of the task.
Myth 5. If you know how well you did during training, learning has taken place.	Feedback must provide more than just a rating of "good" or "bad." It should be diagnostic and constructive, based on the processes performed during training, specific to the trainees' skill performance, and provide an indication of how the trainee can improve.
Myth 6. Positive reactions to what happened during training lead to learning.	Research suggests that just because trainees liked training does not mean that the trained knowledge, skills, and attitudes were learned. It is important that organizations look at training beyond reactions to accurately assess, diagnose, and evaluate the program.
Myth 7. If one learns during training, this will lead to behavior change on the job.	Research suggests that just because trainees learn the trained knowledge, skills, and attitudes, these may not transfer to the job. Transfer requires that the material learned in training be generalized to the job setting and that skills be retained over time.
Myth 8. Team training is just a program.	Team training involves the design and delivery of instructional strategies and requires the integration of tools, methods, and content, as well as organizational support.
Myth 9. Team training equals crisis resource management training.	Crisis resource management training is just one team training strategy. There are a number of other proven team training strategies that can improve patient safety (e.g., cross-training, team leadership training, team self-correction).
Myth 10: Team training is a one-time deal.	Results of longitudinal studies in the aviation community have shown that team work behaviors and attitudes toward teamwork decline over time without refresher training (e.g., Irwin, 1991). These results are likely to be found in the health care community as well. As such, recurrent team training should be offered to patient safety professionals.

The information gained from the team task analysis phase will drive the objectives of the team training program. When developing training objectives, it is important that they be specific, measurable, and task relevant so that they can be evaluated

after the completion of training. The training objectives, which guide the training, are important for three key reasons. Training objectives (a) state how trainees should be able to perform after training (i.e., at what level) to be judged acceptable;

(b) describe the conditions during which the performance, stated previously, should occur; and (c) provide a description of acceptable performance criterion (Goldstein, 1993). In sum, training objectives state what competencies trainees are expected to acquire and demonstrate after the completion of training. After clearly defining the training objectives, they are used to guide what instructional strategies should be implemented based on their effectiveness at promoting the task-relevant team competencies as stated in the objectives.

Best Practice 5. Health care organizations should consider a variety of proven team training strategies beyond CRM training.

Once the training objectives have been established, the next step is to determine what instructional strategies will be used during training (i.e., how to train the requisite safe behaviors). There are numerous instructional strategies that have been developed over the past several decades that can prepare both individuals and teams to increase their KSAs, reduce errors, and increase their expertise in performing their tasks—ultimately leading to safe behaviors. When training individuals to perform safe behaviors, we argue that there are three important issues. First, trainees should learn to be adaptable to changing situations and to recognize when things go wrong. By training flexible knowledge structures (i.e., cognitive representations), trainees can adjust their behavior to compensate for any changes. Rigid knowledge structures in a changing environment could lead to errors. Second, we argue that all training strategies must provide trainees with constructive feedback that focuses on the task. Providing feedback to trainees allows them to compensate for incorrect behaviors and readjust or correct their strategy to be more appropriate for a given situation. Finally, training needs to be dynamic (i.e., interactive). A recent report suggests that almost 84% of all companies use classroom-based and instructor-led training (Bassi & Van Buren, 1998). In addition, it was discovered that the most commonly used delivery methods (approximately 90% of the time) were videotapes and workbooks, as compared to only 10% that used interactive, digital technologies. Computer-based or other technology-based training was used less than 35% of the time. Therefore, we argue that training for teamwork must involve providing the trainees with opportunities to practice the teamwork behaviors (e.g., role-play, simulations). Table 44-2 presents some frequently used instructional strategies that may be used to improve safe practices in

the workplace. We focus on six: CRM training, simulation-based training, cross-training, assertiveness training, team self-correction, and team leadership training.

Best Practice 5a. CRM training should be used to improve how team members communicate and coordinate effectively.

CRM training is a commonly used instructional strategy to train teams in health care. As teams are sometimes required to switch from explicit to implicit coordination (Ennin & Serfaty, 1999; Kleinman & Serfaty, 1989), CRM training has been shown to make this possible (Serfaty, Entin, & Johnston, 1998). CRM training teaches teams to use all available resources (i.e., people, equipment, and information). A recent review by Salas and colleagues (in press) examined the impact of CRM training on patient safety in health care. Due to the infancy of this training strategy in health care, its impact on patient safety, although promising, is not fully known.

Best Practice 5b. Simulation-based training should be offered to provide trainees the opportunity to practice the trained skills.

Simulation-based training is an instructional strategy helpful in training teams to exhibit teamwork behaviors (Fowlkes, Dwyer, Oser, & Salas, 1998). Simulation-based training offers training designers and developers the ability to embed learning events in scenarios (e.g., as determined from critical incidents data), giving trainees a meaningful framework by which to learn (Fowlkes et al., 1998; Salas & Cannon-Bowers, 2000). Furthermore, this instructional strategy provides trainers with valuable tools, including guidelines and six critical steps to achieve training objectives: trigger events, measures of performance, scenario generation, exercise conduct and control, data collection, and feedback (see Figure 44-1). The key to the success of simulation-based training is that this instructional strategy is practice based paired with feedback, giving trainees the opportunity to practice in scenarios (defined a priori) while performance is being evaluated. Additionally, the embedded events serve to trigger the trained behaviors at a predetermined time so that they can best be evaluated and feedback provided.

Best Practice 5c. Cross-training should be used to foster a shared understanding of each team member's roles and responsibilities.

Another instructional strategy used to train teamwork-related competencies is cross-training. Cross training involves exposing trainees to the

The Conditions and Processes of Team Performance

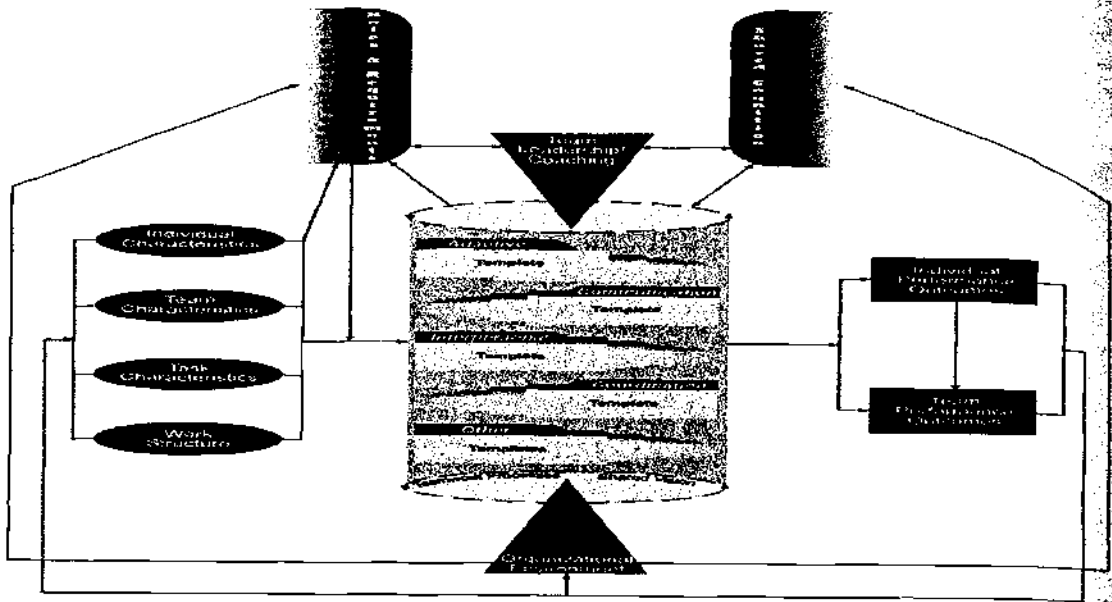


Figure 44-1. Conditions and processes of team performance.

goals, roles, tasks, and responsibilities of other team members within the team (Salas & Cannon-Bowers, 2000). There are two advantages to cross-training: (a) trainees learn and practice the tasks required of team members, allowing them to gain some degree of proficiency to assist with each others' tasks; and (b) a common understanding of the roles and responsibilities of others is created and reinforced. This can lead to a more common shared knowledge structure that can be measured in an effort to approximate the shared mental model of the team (see Cooke, Salas, & Cannon-Bowers, 2000). This allows team members to effectively monitor each others' performance and provide assistance as needed.

Best Practice 5d. Assertiveness training should be offered to ensure that each team member's ideas, opinions, and concerns are heard in an appropriate manner.

Assertiveness training involves teaching team members to clearly and directly communicate their concerns, ideas, feelings, and needs to others (Jentsch & Smith-Jentsch, 2001). Assertiveness training is important not only because it trains less senior team members to feel comfortable providing input (e.g., nurses sharing concerns with doctors), but also because it teaches them to communicate

this information in a manner that does not demean others or infringe on their rights. Finally, assertiveness training also teaches more senior team members to accept information from a team member of lower status without feeling threatened. Assertiveness training does not attempt to remove the authority of the team leader (e.g., doctor), but rather its purpose is to ensure that critical information (i.e., through concerns, ideas, and so on) does not go unspoken.

Best Practice 5e. Team self-correction training should offer trainees a means to providing feedback in a timely, constructive manner.

Team self-correction is based on the theory of shared mental models (Blickensderfer, Cannon-Bowers, & Salas, 1997a, 1997b) and requires not only that individual team members have an accurate mental model of the teamwork processes that will influence their performance, but also that the whole team shares the same (or at least an overlapping) mental model (Smith-Jentsch, Zeisig, Acton, & McPherson, 1998). Specific examples of teamwork can be used to facilitate an understanding of what general team skills should look and sound like during exercises, fostering the team's shared mental model (Smith-Jentsch et al., 1998). The team must

also be self-correcting and providing feedback to team members. There are a number of self-correcting mechanisms (e.g., review of team members' actions), ensuring that team members are aware of their own and others' performance. Until someone is trained in self-correcting, it is best to help them. Team self-correction is a considerable teamwork skill. Teamwork is a team to learn from. Bowman and his team's complexity increases. Leaders must train team members. However, availability to train team leaders. As a consequence, development may be necessary. Gully, Lumsden, and Smith's cooperative coaction (e.g., team members who encourage team members to lead better. Overcoming a team's self-correction. Best Practice 5d. that it is a team's self-correction. In teamwork, using self-correction includes lecturing.

also be provided with formal training on how to self-correct, monitor one another's performance, and provide constructive, nonaccusatory feedback to team members in a debrief setting, thus creating a natural tendency (Salas & Cannon-Bowers, 2000). There are four critical elements or stages to team self-correction as a part of the debrief: event review or recap (both positive and negative behaviors), error identification and feedback exchange, stating of expectations, and planning for the future. Until self-correction becomes a natural tendency for the team through practice, it is important that a trained instructor or team leader facilitate these self-correction methods.

Best Practice 5f. Team leadership training should be used to help team members reach their goals in an effective manner.

Team leadership has been shown to have a considerable impact on the promotion of the dynamic, teamwork processes (i.e., the KSAs) required for a team to perform its tasks (Komaki, Desselles, & Bowman, 1989; Zaccaro, Rittman, & Marks, 2001) and becomes increasingly important as the complexity of the team and the work environment increases (Jacobs & Jacques, 1987). Without team leadership, the team may fail. Unfortunately, no formal training technique exists for training team leaders. However, there are a number of guidelines available in the literature to help organizations identify the team leader's role. One way in which the team leader can lead the team is through coaching. As a coach, the team leader can help team members develop strategies to overcome process losses that may be occurring (e.g., communication; Kozlowski, Gully, Salas, & Cannon-Bowers, 1996). Martin and Lumsden (1987) offered several strategies for effective coaching; namely, the team leader should (a) praise those processes and efforts that are desirable (e.g., open communication), (b) reward team members when desired behaviors are exhibited, and (c) encourage positive interactions among team members (e.g., avoid stereotyping). When the team leader takes on the role of a coach, he or she will better motivate team members to work together to overcome their differences and to be successful as a team.

Best Practice 6. Team training should be developed such that it facilitates the presentation, demonstration, and practice of teamwork competencies.

Information pertaining to the training of teamwork competencies should be provided to trainees using a number of methods. These methods include presenting information in the form of lectures, demonstration of teamwork behaviors via

videos, and practice of behaviors using role-playing or guided practice. Depending on the stage of training, one method may work better than another. For example, lecture-based training is a useful way to first develop an understanding of the teamwork competencies (e.g., what they are, why they are important; Salas & Cannon-Bowers, 2000). Demonstration-based training is useful for developing competencies that are task contingent, whereas as practice-based training is useful for developing team-contingent competencies (Salas & Cannon-Bowers, 2000).

Best Practice 7. Team training should include the means for providing constructive, timely feedback to trainees.

Providing feedback to trainees in a constructive and timely manner is important to the success of a team training program (Cannon-Bowers & Salas, 1997). This requires that several criteria are met. First, feedback should be based on the teamwork processes performed during practice and on the training outcomes. Next, feedback provided to trainees should be specific to the skill performance of trainees but not critical of the individual. Third, feedback should provide trainees with the necessary knowledge that allows them to adjust their learning strategies to meet the expected performance levels. Finally, feedback must be meaningful to trainees and focus on both individual and team performance. Without feedback, breakdowns in performance may go unnoticed by trainees, corrective strategies will not be developed, and errors will likely occur on the job.

Best Practices for Evaluating and Transferring Team Training

The posttraining environment is important in determining whether the competencies learned during training will transfer to the actual job. Regardless of how well the training program was developed, without an environment that encourages the transfer of the learned competencies, it will not be effective. Research suggests that several characteristics of the work environment are essential for the transfer of training: (a) supervisor support, (b) organizational transfer climate, and (c) continuous-learning culture, although supporting empirical evidence is limited (see Baldwin & Ford, 1988; Ford & Weissbein, 1997; Rouiller & Goldstein, 1993; Tracey et al., 1995). Additionally, it is argued that some elements of the transfer climate may facilitate (e.g., rewards, positive transfer climate) or hinder (e.g., lack of peer or

supervisor support, lack of resources) the transfer of training (Rouiller & Goldstein, 1993; Tannenbaum & Yukl, 1992). We briefly discuss how supervisor support and organizational transfer climate can promote the transfer of training.

Best Practice 8. Training evaluations should be developed to focus on multiple levels of the training program.

Once the instructional strategy has been chosen and the training program has been implemented, it is imperative that the training (or team training) be evaluated. Few organizations conduct systematic evaluations of their training programs. Although we acknowledge that evaluation can be resource intensive, it is the only way to truly assess training's effectiveness—whether training yielded the expected outcomes. There are numerous methods of assessment that can be applied to training. We argue for the use of a multilevel approach, such as that suggested by Kirkpatrick (1976). Kirkpatrick proposed a method of training evaluation that constituted a multilevel approach to evaluating the outcomes of training programs. He argued that training evaluation should include assessment at four levels: (a) reactions (i.e., what trainees think of the training), (b) learning (i.e., what trainees learned), (c) behavior (i.e., how trainees' behavior changes), and (d) results (i.e., impact on organization). Building on Kirkpatrick's framework, Kraiger, Ford, and Salas (1993) outlined three similar outcomes of training programs: (a) affective (i.e., reactions), (b) cognitive (i.e., learning), and (c) skill-based (i.e., behavior) outcomes. Several training reviews have been conducted recently arguing for the use of a multilevel approach to training evaluation (Alliger & Janak, 1989; Salas et al., 2001).

Best Practice 9. Supervisor support following training should be encouraged to improve transfer of (team) training.

Supervisor support has been argued to influence the transfer of learned teamwork competencies to the actual task environment. Thus, if trainees perceive that the teamwork competencies are valued by the organization and management, they will be more likely to integrate what they learned on the job. Research indicates that discussions held by supervisors prior to and following training (e.g., Huczynski & Lewis, 1980), supervisor sponsorship (e.g., Brinkerhoff & Montesino, 1995), and opportunities to perform the learned skills (Ford, Quinones, Segó, & Speer, 1991) result in transfer of learned skills to the job. However, Baldwin and Ford (1988) argued that there is a lack of understanding regarding the behaviors that lead trainees to perceive support. Tannenbaum and Yukl (1992) stated that supervisor

support could include goal-setting activities (e.g., minimize number of accidents), reinforcement (e.g., error reporting), and modeling of trained behaviors (e.g., teamwork behaviors). Finally, it is important that the performance appraisals and reward systems used by supervisors focus on outcomes at the team level, not just the individual level (Cannon-Bowers, Salas, & Milham, 2000; Smith-Jentsch, Salas, & Brannick, 2001). Although these results are encouraging, additional research is needed to determine the true impact of supervisor support on transfer of training.

Best Practice 10. An organizational climate that encourages continuous learning should be created to improve transfer of team training.

Research supporting the role of an organization's climate on the transfer of training is slightly larger than that of supervisor support. Organizational climate can be defined as the interaction among elements within the organizational setting that are observable as well as those that are perceived by trainees (Hellreigel & Slocum, 1974; James & Jones, 1974). Research suggests that trainees who perceive a positive organizational climate (e.g., organizational support, rewards) apply learned competencies on the job (Baumgartel, Reynolds, & Pathan, 1984; Rouiller & Goldstein, 1993; Tracey et al., 1995). In addition, we argue that a continuous-learning culture (a part of the organizational climate) that supports and provides opportunities to acquire and demonstrate teamwork knowledge and skills, reinforces achievement, and encourages innovation and competition (Dubin, 1990; Rosow & Zager, 1988; Tracey et al., 1995) is important. Teams that are subjected to this positive environment understand that learning is a part of their daily work environment, and thus it is accepted. Research conducted by Tracey et al. suggests that trainees who perceived a continuous-learning environment demonstrated more posttraining behaviors. In high consequences environments where errors can be fatal, such as in health care, a continuous-learning environment is necessary to encourage team members to continuously demonstrate teamwork behaviors learned during training and to learn from any errors that do occur.

CONCLUDING REMARKS

This chapter has provided a brief summary of what we know about teamwork and team training, which can be useful and applicable to guide the design, delivery, evaluation, and transfer of team training in

health care. Much of what we know, we submit, is applicable. The science of team training has produced tools, techniques, strategies, and lessons learned that can be very useful (once adapted) to enhance patient safety. So there is much that can be directed toward improving teamwork in the operating rooms, emergency rooms, intensive care units, Code Blue calls, and other health care situations.

We hope this chapter helps implement and institutionalize effective team training strategies in health care. We also hope that partnerships are

created between those who know team training with those who know health care and together create training systems that improve patient safety. We hope this chapter will motivate additional research in, for example, multicultural medical teams and simulation-based training and that it illustrates that there are more team training strategies than just CRM. Finally, we hope this chapter helps health care organizations implement sound training to reduce errors and improve patient safety.

References

- Alliger, G., & Janak, E. (1989). Kirkpatrick's levels of training criteria: Thirty years later. *Personnel Psychology*, 42, 331-342.
- Baldwin, T. T., & Ford, J. K. (1988). Transfer of training: A review and directions for future research. *Personnel Psychology*, 41, 63-105.
- Baldwin, T. T., & Magiuka, R. J. (1997). Organizational context and training effectiveness. In J. K. Ford et al. (Eds.), *Improving training effectiveness in work organizations* (pp. 99-127). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Baldwin, T. T., Magiuka, R. J., & Loher, B. T. (1991). The perils of participation: Effects of choice of training on trainee motivation and learning. *Personnel Psychology*, 44, 51-65.
- Bandow, D. (2001). Time to create sound teamwork. *Journal for Quality and Participation*, 24, 41-47.
- Bassi, L., & Van Buren, M. (1998). The 1998 state of the industry report. *Training and Development*, 52, 22-43.
- Baumgartel, H., Reynolds, M., & Pathan, R. (1984). How personality and organizational-climate variables moderate the effectiveness of management development programmes: A review and some recent research findings. *Management and Labour Studies*, 9, 1-16.
- Blickensderfer, E. L., Cannon-Bowers, J. A., & Salas, E. (1997a). Theoretical bases for team self-correction: Fostering shared mental models. In M. Beyerlein, D. Johnson, & S. Beyerlein (Eds.), *Advances in interdisciplinary studies in work teams series* (Vol. 4, pp. 249-279). Greenwich, CT: JAI.
- Blickensderfer, E. L., Cannon-Bowers, J. A., & Salas, E. (1997b, April). *Training teams to self-correct: An empirical investigation*. Paper presented at the 12th annual meeting of the Society for Industrial and Organizational Psychology, St. Louis, MO.
- Bowers, C. A., Baker, D. P., & Salas, E. (1994). Measuring the importance of teamwork: The reliability and validity of job/task analysis indices for team-training design. *Military Psychology*, 6, 205-214.
- Bowers, C. A., Blickensderfer, E. L., & Morgan, B. B. (1998). Air traffic control specialist team coordination. In M. W. Smolensky & E. S. Stein (Eds.), *Human factors in air traffic control* (pp. 215-236). San Diego, CA: Academic.
- Bowers, C. A., Morgan, B. B., Jr., Salas, E., & Prince, C. (1993). Assessment of coordination demand for aircrew coordination training. *Military Psychology*, 5, 95-112.
- Brinkerhoff, R. O., & Monticino, M. U. (1995). Partnership for training transfer: Lessons from a corporate study. *Human Resource Development Quarterly*, 6, 263-274.
- Burke, C. S. (2004). Team task analysis. In N. Stanton, A. Hedge, K. Brookhuis, E. Salas, & H. Hendrick (Eds.), *Handbook of human factors and ergonomics methods* (pp. 56.1-56.8). London: Taylor & Francis.
- Burke, C. S. (2005). Team task analysis. In N. Stanton, H. Hendrick, S. Konz, K. Parsons, & E. Salas (Eds.), *Handbook of human factors and ergonomics methods* (pp. 56-1 through 56-8). London, UK: Taylor & Francis.
- Campion, M. A., Medsker, G. J., & Higgs, A. C. (1993). Relations between work group characteristics and effectiveness: Implications for designing effective work groups. *Personnel Psychology*, 46, 823-850.
- Cannon-Bowers, J. A., Burns, J. J., Salas, E., & Pruitt, J. S. (1998). Advanced technology in scenario-based training. In J. A. Cannon-Bowers & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 365-374). Washington, DC: American Psychological Association.
- Cannon-Bowers, J. A., & Salas, E. (1997). A framework for measuring team performance measures in training. In M. T. Brannick, E. Salas, & C. Prince (Eds.), *Team performance assessment and measurement: Theory, methods, and applications* (pp. 45-62). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Cannon-Bowers, J. A., & Salas, E. (1998). Team performance and training in complex environments: Recent findings from applied research. *Current Directions in Psychological Science*, 7, 83-87.
- Cannon-Bowers, J. A., Salas, E., & Milham, L. M. (2000). The transfer of team training: Propositions and preliminary guidance. *Advances in Developing Human Resources*, 8, 63-74.
- Cannon-Bowers, J. A., Salas, E., Tannenbaum, S. I., & Mathieu, J. E. (1995). Toward theoretically based principles of training effectiveness: A model and initial empirical investigation. *Military Psychology*, 7, 141-164.
- Cannon-Bowers, J. A., Tannenbaum, S. I., Salas, E., & Volpe, C. E. (1995). Defining team competencies and establishing team training requirements. In R. Guzzo, E. Salas, & Associates (Eds.), *Team effectiveness and decision making in organizations* (pp. 333-380). San Francisco, CA: Jossey-Bass.
- Colquitt, J. A., LePine, J. A., & Noe, R. A. (2000). Toward an integrative theory of training motivation: A meta-analytic path analysis of 20 years of research. *Journal of Applied Psychology*, 85, 678-707.
- Cooke, N. J., Salas, E., & Cannon-Bowers, J. A. (2000). Measuring team knowledge. *Human Factors*, 42, 151-173.
- Cooper, R. K., & Sawaf, A. (1996). *Executive EQ: Emotional intelligence in leadership and organization*. New York: Perigee.

- Cox, T., Jr., Lobel, S. A., & McLeod, P. L. (1991). Effects of ethnic group cultural differences on cooperative and competitive behavior on a group task. *Academy of Management Journal*, 4, 827-847.
- Crane, M. (1997, July). Malpractice is not criminal; mistake is? *The National Law Journal*, A17.
- Driskell, J. E., & Salas, E. (1992). Collective behavior and team performance. *Human Factors*, 34, 277-288.
- Dubin, S. (1990). Maintaining competence through updating. In S. L. Willis & S. S. Dubin (Eds.), *Maintaining professional competence* (pp. 9-43). San Francisco: Jossey-Bass.
- Dweck, C. S. (1986). Motivational processes affecting learning. *American Psychologist*, 41, 1040-1048.
- Dweck, C. S., & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. *Psychological Review*, 95, 256-273.
- Eby, L. T., & Dobbins, G. H. (1997). Collectivistic orientation in teams: An individual and group level analysis. *Journal of Organizational Behavior*, 18, 275-295.
- Ehrenstein, A., Walker, B., Czerwinski, M., & Feldman, E. (1997). Some fundamentals of training and transfer: Practice benefits are not automatic. In M. Quiñones & A. Ehrenstein (Eds.), *Training for a rapidly changing workplace: Applications of psychological research* (pp. 119-147). Washington, DC: American Psychological Association.
- Entin, E. E., & Serfaty, D. (1999). Adaptive team coordination. *Human Factors*, 41, 312-325.
- Fleishman, E. A., Mumford, M. D., Zaccaro, S. J., Levin, K. Y., Korotkin, A. L., & Hein, M. B. (1991). Taxonomic efforts in the description of leader behavior: A synthesis and functional interpretation. *Leadership Quarterly*, 2, 245-287.
- Fleishman, E. A., & Zaccaro, S. J. (1992). Toward a taxonomy of team performance functions. In R. W. Swezey & E. Salas (Eds.), *Teams: Their training and performance* (pp. 31-56). Norwood, NJ: Ablex.
- Ford, J. K., Kozlowski, S., Kraiger, K., Salas, E., & Teachout, M. (Eds.). (1997). *Improving training effectiveness in work organizations*. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Ford, J. K., Quinones, M., Segó, D., & Speer, J. (1991, April). Factors affecting the opportunity to use trained skills on the job. Paper presented at the 6th Annual Conference for the Society of Industrial and Organizational Psychology, St. Louis, MO.
- Ford, J. K., Smith, E. M., Weissbein, D. A., Gully, S. M., & Salas, E. (1998). Relationships of goal-orientation, metacognitive activity, and practice strategies with learning outcomes and transfer. *Journal of Applied Psychology*, 83, 218-233.
- Ford, J. K., & Weissbein, D. A. (1997). Transfer of training: An updated review and analysis. *Performance Improvement Quarterly*, 10, 22-41.
- Fowlkes, J., Dwyer, D. J., Oser, R. L., & Salas, E. (1998). Event-based approach to training (EBAT). *International Journal of Aviation Psychology*, 8, 209-221.
- Glickman, A. S., Zimmer, S., Montero, R. C., Guerette, P. J., Morgan, B. B., Jr., & Salas, E. (1987). *The evolution of teamwork skills: An empirical assessment with implications for training*. Technical report for the Naval Training Systems Center. Orlando: University of Central Florida.
- Goldstein, I. L. (1993). *Training in organizations* (3rd ed.). Pacific Grove, CA: Brooks/Cole.
- Goldstein, I. L., & Ford, J. K. (2002). *Training in organizations: Needs assessment, development, and evaluation* (4th ed.). Belmont, CA: Wadsworth.
- Griepentrog, B. K., & Fleming, P. J. (2003, April). *Shared mental models and team performance: Are you thinking what we're thinking?* Paper presented at the 18th annual meeting of the Society for Industrial/Organizational Psychologists, Orlando, FL.
- Hackman, R. (Ed.). (1990). *Groups that work (and those that don't): Creating conditions for effective teamwork*. San Francisco, CA: Jossey-Bass.
- Hellreigel, D., & Slocum, J. W. (1974). Organizational climate: Measures, research, and contingencies. *Academy of Management Journal*, 17, 255-280.
- Huczynski, A. A., & Lewis, J. W. (1980). An empirical study into the learning transfer process management training. *Journal of Management Studies*, 17, 227-240.
- Hunter, J. E. (1986). Cognitive ability, cognitive aptitudes, job knowledge, and job performance. *Journal of Vocational Behavior*, 29, 340-362.
- Irwin, C. M. (1991). The impact of initial and recurrent cockpit resource management training on attitudes. In R. S. Jensen (Ed.), *Proceedings of the 6th International Symposium on Aviation Psychology* (pp. 344-349). Columbus, OH: The Ohio State University.
- Jacobs, T. O., & Jaques, E. (1987). Leadership in complex systems. In J. Zeidner (Ed.), *Human productivity enhancement Vol. 2. Organizations, Personnel, and decision making*, (pp. 7-65). New York, NY: Praeger.
- James, L. R., & Jones, A. P. (1974). Organizational climate: A review of theory and research. *Psychological Bulletin*, 81, 1096-1112.
- Jentsch, F., & Smith-Jentsch, K. (2001). Assertiveness and team performance: More than "just say no." In E. Salas, C. Bowers, & E. Edens (Eds.), *Improving teamwork in organizations* (pp. 73-94). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Joint Commission Resources (Ed.). (1998). *Sendinel events: Evaluating cause and planning improvement*, 2nd ed. Oak Brook, IL: Joint Commission Resources.
- Kirkpatrick, D. L. (1976). Evaluation of training. In R. L. Craig (Ed.), *Training and development handbook: A guide to human resource development* (2nd ed., pp. 1-26). New York: McGraw-Hill.
- Kleinman, D. L., & Serfaty, D. (1989, April). *Team performance assessment in distributed decision making*. Paper presented at the Simulation and Training Research Symposium on Interactive Networked Simulation for Training, Orlando, FL.
- Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (Eds.). (1999). *To err is human: Building a safer health system*. Washington, DC: National Academy Press.
- Komaki, J., Desselles, M., & Bowman, E. (1989). Definitely not a breeze: Extending an operant model of effective supervision teams. *Journal of Applied Psychology*, 74, 522-529.
- Kozlowski, S. W. J., Gully, S. M., Salas, E., & Cannon-Bowers, J. A. (1996). Team leadership and development: Theory, principles, and guidelines for training leaders and teams. In M. Beyerlein, S. Beyerlein, & D. Johnson (Eds.), *Advances in interdisciplinary studies of work teams: Team leadership* (Vol. 3, pp. 253-292). Greenwich, CT: JAI.
- Kraiger, K., Ford, J. K., & Salas, E. (1993). Application of cognitive, skill-based, and affective theories of learning outcomes to new methods of training evaluation. *Journal of Applied Psychology*, 78, 311-328.
- Leape, L. L. (1994). The preventability of medical injury. In M. S. Bogner (Ed.), *Human error in medicine* (pp. 13-25). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Marks, M. A. (2000). A critical analysis of computer simulations for conducting team research. *Small Group Research*, 31, 653-675.
- Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A conceptual framework and taxonomy of team processes. *Academy of Management Review*, 26, 356-376.

- Martin, G. L., & Lumsden, J. A. (1987). *Coaching: An effective behavioral approach*. St. Louis, MO: Mosby.
- Martocchio, J. J., & Webster, J. (1992). Effects of feedback and cognitive playfulness on performance in microcomputer software training. *Personality Psychology, 45*, 553-578.
- Mathieu, J. E., Heffner, T. S., Goodwin, G. F., Salas, E., & Cannon-Bowers, J. A. (2000). The influence of shared mental models on team process and performance. *Journal of Applied Psychology, 85*, 273-283.
- Mathieu, J. E., Tannenbaum, S. I., & Salas, E. (1992). An influence of individual and situational characteristics on training effectiveness measures. *Academy of Management Journal, 35*, 827-847.
- McIntyre, R. M., & Salas, E. (1995). Measuring and managing for team performance: Emerging principles from complex environments. In R. A. Guzzo & E. Salas (Eds.), *Team effectiveness and decision making in organizations* (pp. 9-45). San Francisco, CA: Jossey-Bass.
- McNeese, M., & Rentsch, J. (2001). Identifying the cognitive and social requirements of teamwork using collaborative task analysis. In M. D. McNeese, E. Salas, & M. R. Endsley (Eds.), *New trends in cooperative activities: System dynamics in complex environments* (pp. 96-113). Santa Monica, CA: Human Factors and Ergonomics Society.
- Mohammed, S., Klimoski, R., & Rentsch, J. R. (2000). The measurement of team mental models: We have no shared schema. *Organizational Research Methods, 3*, 123-165.
- Noc, R. A. (1986). Trainee attributes and attitudes: Neglected influences on training effectiveness. *Academy of Management Review, 4*, 736-749.
- Phillips, J. M., & Gully, S. M. (1997). Role of goal orientation, ability, need for achievement, and locus of control in the self efficacy and goal setting process. *Journal of Applied Psychology, 82*, 792-802.
- Pietro, D. A., Shyavitz, L. J., Smith, R. A., & Auerbach, B. S. (2000). Detecting and reporting medical errors: Why the dilemma? *British Medical Journal, 320*, 794-796.
- Potter, C. O. L. H., Hollenbeck, J. R., Ilgen, D. R., Ellis, A. P. J., West, B. J., & Moon, H. (2003). Backing up behaviors in teams: The role of personality and legitimacy of need. *Journal of Applied Psychology, 88*, 391-403.
- Quinones, M. A. (1995). Pretraining context effects: Training assignment as feedback. *Journal of Applied Psychology, 80*, 226-238.
- Quinones, M. A. (1997). Contextual influencing on training effectiveness. In M. A. Quinones & A. Ehrenstein (Eds.), *Training for a rapidly changing workplace: Applications of psychological research* (pp. 177-200). Washington, DC: American Psychological Association.
- Ree, M. J., Carretta, T. R., & Teachout, M. S. (1995). Role of ability and prior job knowledge in complex training performance. *Journal of Applied Psychology, 80*, 721-730.
- Ree, M. J., & Earles, J. A. (1991). Predicting training success: Not much more than G. *Personality Psychology, 44*, 321-332.
- Rentsch, J. R., & Klimoski, R. J. (2001). Why do "great minds" think alike? Antecedents of team member schema agreement. *Journal of Organizational Behavior, 22*, 107-120.
- Rosow, J. M., & Zager, R. (1988). *Training the competitive edge*. San Francisco, CA: Jossey-Bass.
- Rouiller, J. Z., & Goldstein, I. L. (1993). The relationship between organizational transfer climate and positive transfer of training. *Human Resource Development Quarterly, 4*, 377-390.
- Salas, E., Burke, C. S., Bowers, C. A., & Wilson, K. A. (2001). Team training in the skies: Does crew resource management (CRM) training work? *Human Factors, 43*, 641-674.
- Salas, E., Burke, C. S., & Stagl, K. C. (2004). Developing teams and team leaders: Strategies and principles. In D. Day, S. J. Zaccaro, & S. M. Halpin (Eds.), *Leader development for transforming organizations: Growing leaders for tomorrow* (pp. 325-355). Mahwah, NJ: Lawrence Erlbaum Associates, Inc.
- Salas, E., & Cannon-Bowers, J. A. (1997). Methods, tools, and strategies for team training. In M. A. Quinones & A. Ehrenstein (Eds.), *Training for a rapidly changing workplace: Applications of psychological research* (pp. 249-279). Washington, DC: American Psychological Association.
- Salas, E., & Cannon-Bowers, J. A. (2000). The anatomy of team training. In S. Tobias & J. D. Fletcher (Eds.), *Training and retraining: A handbook for business, industry, government, and the military* (pp. 312-335). New York: Macmillan Reference.
- Salas, E., & Cannon-Bowers, J. A. (2001). The science of training: A decade of progress. *Annual Review of Psychology, 52*, 471-499.
- Salas, E., Cannon-Bowers, J. A., & Johnston, J. H. (1997). How can you turn a team of experts into an expert team?: Emerging training strategies. In C. E. Zsombok & G. Klein (Eds.), *Naturalistic decision making* (pp. 359-370). Mahwah, NJ: Lawrence Erlbaum Associates.
- Salas, E., Dickenson, T. L., Converse, S. A., & Tannenbaum, S. I. (1992). Toward an understanding of team performance and training. In R. J. Swzey & E. Salas (Eds.), *Teams: Their training and performance* (pp. 3-29). Norwood, NJ: Ablex.
- Salas, E., Rhodenizer, L., & Bowers, C. A. (2000). The design and delivery of CRM training: Exploiting available resources. *Human Factors, 42*, 490-511.
- Salas, E., Sims, D. E., Klein, C., & Burke, C. S. (2003). Can teamwork enhance patient safety? *Forum, 23*, 5-9.
- Salas, E., Wilson-Donnelly, K. A., Burke, C. S., & Priest, H. A. (2005). Using simulation-based training to improve patient safety: What does it take? *Joint Commission Journal on Quality and Patient Safety, 31*(7), 363-371.
- Serfaty, D., Entin, E. E., & Johnston, J. H. (1998). Team coordination training. In J. A. Cannon-Bowers & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 221-246). Washington, DC: American Psychological Association.
- Shamir, B. (1990). Calculations, values and identities: The sources of collectivistic work motivation. *Human Relations, 43*, 313-332.
- Shute, V. J., & Gawlick, L. A. (1995). Practice effects on skill acquisition, learning outcome, retention, and sensitivity to relearning. *Human Factors, 37*, 781-803.
- Smith-Jentsch, K., Salas, E., & Baker, D. P. (1996). Training team performance-related assertiveness. *Personnel Psychology, 49*, 909-936.
- Smith-Jentsch, K. A., Salas, E., & Brannick, M. T. (2001). To transfer or not to transfer? Investigating the combined effects of trainee characteristics, team leader support, and team climate. *Journal of Applied Psychology, 86*, 279-292.
- Smith-Jentsch, K. A., Zeisig, R. L., Acton, B., & McPherson, J. A. (1998). Team dimensional training: A strategy for guided team self-correction. In J. A. Cannon Bowers & E. Salas (Eds.), *Making decisions under stress: Implications for individual and team training* (pp. 271-297). Washington, DC: American Psychological Association.
- Stevens, M. J., & Campion, M. A. (1994). The knowledge, skill and ability requirements for teamwork: Implications for human resource management. *Journal of Management, 20*, 503-530.
- Stevens, M. J., & Campion, M. A. (1999). Staffing work teams: Development and validation of a selection test for teamwork settings. *Journal of Management, 25*, 207-228.

- Stewart, G. L., & Manz, C. C. (1995). Leadership for self-managing work teams: A typology and integrative model. *Human Relations, 48*, 747-770.
- Stout, R. J., Salas, E., & Fowlkes, J. E. (1997). Enhancing teamwork in complex environments through team training. *Group Dynamics, 1*, 169-182.
- Tannenbaum, S. I., Mathieu, J. E., Salas, E., & Cannon-Bowers, J. A. (1991). Meeting trainees' expectations: The influences of training fulfillment on the development of commitment, self-efficacy, and motivation. *Journal of Applied Psychology, 76*, 759-769.
- Tannenbaum, S. I., & Yukl, G. (1992). Training and development in work organizations. *Annual Review of Psychology, 43*, 399-441.
- Tracey, J. B., Tannenbaum, S. I., & Kavanagh, M. J. (1995). Applying trained skills on the job: The importance of work environment. *Journal of Applied Psychology, 80*, 239-252.
- Volpe, C. F., Cannon-Bowers, J. A., Salas, E., & Spector, P. E. (2001). The impact of cross-training on team functioning: An empirical investigation. In R. W. Swezey & D. H. Andrews (Eds.), *Readings in training and simulation: A 30-year perspective* (pp. 115-128). Santa Monica, CA: Human Factors and Ergonomics Society.
- Webber, S. S. (2002). Leadership and trust facilitating cross-functional team success. *Journal of Management Development, 21*, 201-274.
- Zaccaro, S. J., Rittman, A. L., & Marks, M. A. (2001). Team leadership. *The Leadership Quarterly, 12*, 451-483.

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