The provision of high-quality, efficient care results from the coordinated, cooperative efforts of multiple technically competent health care providers working in concert over time, spanning disciplinary and professional boundaries. Accordingly, the role of medical education must include the development of providers who are both expert clinicians and expert team members. However, the competencies underlying effective teamwork are only just beginning to be integrated into medical school curricula and residency programs. Therefore, continuing education (CE) is a vital mechanism for practitioners already in the field to develop the attitudes, behaviors (skills), and cognitive knowledge necessary for highly reliable and effective team performance.

The present article provides an overview of more than 30 years of evidence regarding team performance and team training in order to guide, shape, and build CE activities that focus on developing team competencies. Recognizing that even the most comprehensive and well-designed team-oriented CE programs will fail unless they are supported by an organizational and professional culture that values collaborative behavior, ten evidence-based lessons for practice are offered in order to facilitate the use of the science of team-training in efforts to foster continuous quality improvement and enhance patient safety.

Key Words: patient care team, continuing education, training, health care quality, access, evaluation, safety

Introduction

The purpose of medical education is to develop providers with the highest level of technical skill. However, given the rate of technological and process advancement in health care today, the provision of safe and effective care demands a lifelong dedication to continuous learning and development. Furthermore, effective and efficient performance of complex, interdependent tasks requires that providers be not only highly competent in their technical skills, but also proficient team members. The new era in health care—focused on streamlined, coordinated care—demands that providers communicate, coordinate, and collaborate in new and effective ways. Teamwork skills supported by critical team attitudes and knowledge are vital for coordinating core technical clinical skills toward the ultimate outcome—patient health and safety. Additionally, recent studies examining the effects of disruptive behavior demonstrate its negative impact on communication, information flow, collaboration, and patient safety. There is a clear need to ensure that providers—regardless of hierarchy, personality, quirks, personal “style,” or professional tenure—are not only equipped with the competencies necessary for working effectively in a team environment, but are reinforced for using them in daily practice.

The need to address teamwork competencies through continuing education outlets is also clear from a standards and regulations perspective. For example, communication, partnership, and teamwork are identified as core domain competencies by the European General Medical Council (GMC; http://www.gmc-uk.org, accessed August 20, 2010), the Accreditation Council for Graduate Medical Education (ACGME; www.acgme.org, accessed August 20, 2010), the American Medical Association (AMA; www.ama.org, accessed August 20, 2010), the Australian Medical Council (AMC; http://goodmedicalpractice.org.au/).
accessed August 20, 2010), the Medical Council of Canada (MCC; www.mcc.ca, accessed August 20, 2010), and numerous others. For example, the AMC’s Code of Physician Conduct dedicates an entire section to the 15 principles defining good practice related to teamwork, respect for medical colleagues and other health care professionals, delegation, referrals, handovers, and coordination of care. Similar provisions exist in professional conduct codes across the spectrum of care providers.

Such competency requirements underscore the need for interprofessional, multidisciplinary approaches across the full spectrum of health care education. However, simply training in a group setting does not equate to team training and does not mean that teamwork competencies will be developed. For example, in their outcomes framework for planning and assessing CME, Moore and colleagues4 draw on the vast body of evidence regarding training, adult learning, and evaluation2−9 to underscore that CE programs must move beyond simple attendance and trainee reaction criteria to incorporate measures of procedural learning, competence in formative assessments, performance in the actual work place, patient health, and higher-level outcomes such as community health. To achieve such outcomes for both clinical and nontechnical skills, CE must rethink its reliance on information-based training methods and move to incorporate advanced learning strategies, such as simulation-based training and on-the-job active learning strategies, including peer-based mentoring and facilitator coaching.10−14 Additionally, content must be designed to cover topics related to transfer of training and adoption of attitudes, behaviors, and cognitions underlying effective teamwork into daily practice.

Organized in terms of recommendations, this article synthesizes more than three decades of existing evidence on team performance and team training available to guide, shape, and build CE opportunities focused on developing teamwork competencies. We begin by offering several thoughts framing the motivation behind this article—a case for why teamwork is an important topic to address through the vehicle of continuing education. Subsequently, we outline relevant and transportable team competencies that can be targeted during continuing education, followed by an overview of several relevant team-training strategies and approaches to measurement. Lastly, we suggest several guidelines for using the science of team training to foster continuous quality improvement and enhance patient safety in the continuing education context.

Why Do Nontechnical Teamwork Skills Matter in Continuing Education?

Continuing education (CE) is a vital mechanism for ensuring that practitioners already in the field develop the attitudes, behaviors, and cognitions (ie, declarative and procedural knowledge regarding what effective teamwork is and when to use it) necessary for highly reliable and effective team performance. These ABCs of teamwork are the building blocks of teamwork competencies such as communication, cooperation, and coordination. Ideally, lifelong learning builds upon early foundations established during the formative years of professional development (eg, undergraduate and graduate education). CE today, however, is a critical mechanism through which providers learn new technologies, techniques, and approaches to practice that may never have been introduced (or, in the case of many technologies, have even existed) in their early education. While the concept of health care as a team endeavor has been integrated as a critical part of the health care vocabulary, teamwork concepts are only starting to be woven into the fabric of medical, nursing, and other health professional training.15,16 Just as laparoscopic surgery was learned by some of the early pioneers through CE avenues, CE is poised to play a critical role in refining and reinforcing the effective teamwork competencies of practicing providers.

Furthermore, it is critical that established practitioners also be facile team members in order to properly model effective team behaviors in the daily clinical context for developing practitioners still in training. The dominant paradigm within medical education continues to be the apprentice model; learners are inevitably swayed by how they see current providers practice. Practical learning experiences (eg, internship, residency) shape learner perceptions of professional norms, values, and mental models of desirable behavior to a much stronger extent than any classroom experience. When behavioral norms enacted in actual practice clash with classroom admonitions, it is the real-world behaviors that learners most often adopt. This is one of the challenges of learning at and learning through work. It is therefore crucial to ensure that current practitioners support and model the basics of effective teamwork that educators are striving to instill in the next generation of providers. In this sense, CE is a critical vehicle for creating a community of practice dedicated to the development, use, and reinforcement of effective teamwork in practice.17

While it is true that one model of teamwork or a specific set of teamwork skills will not fit every type of health care team, more than three decades’ research has identified several core competencies transportable across a broad range of team configurations, tasks, and contexts. As an evidence-based practice, health care can draw from this existing evidence to develop meaningful and effective teamwork-oriented CE opportunities. Recent meta-analyses demonstrate that team-training works.17−20 For example, an analysis17 of 93 effect sizes across 2650 teams found that up to 20 percent of the variance in team processes (ρ = .44) and outcomes (ρ = .39) can be attributed to participation in team-training. Additionally, results indicated that regardless of whether teams worked together on a regular basis or came together on an ad-hoc basis, team-training demonstrated similar effect sizes.

Team-training offers a competency-based approach for developing the ABCs underlying effective practice. It creates a common language for identifying and discussing
What to Train: Teamwork Competencies

Researchers and practitioners have developed many innovative approaches to building high-functioning teams. From these efforts, it can be concluded that effective training and educational interventions share a common focus in terms of the content of instruction: teamwork competencies rooted in the science of teams. This section provides an introduction to teamwork competencies for CE. First, we provide definitions to clarify the concept of teamwork competencies. Second, we discuss a distinction between two general types of competencies—generic and specific. Third, we provide an overview of the major attitude, behavior, and cognitive teamwork competencies—termed the ABCs of teamwork—rooted in the current science of teams.

What is Teamwork?: Taskwork versus Teamwork

The dimensions and concepts of teamwork in health care are often discussed under the broad concepts of interprofessional learning, collaboration, and care. A recent review of continuing interprofessional education offered several definitions of these constructs; however, the need for conceptual clarity, theoretical grounding, and granularity were highlighted as important future research needs. To define teamwork, it frequently is contrasted with taskwork. Taskwork refers to the aspects of performance associated with an individual; it is the noninterdependent components of an individual’s performance. In health care, this includes such things as skill performing specific procedures and diagnostic reasoning. Teamwork, then, is the interdependent aspects of performance or the components of team members’ tasks that require joint action to complete. Just as with taskwork or clinical performance, there are specific competencies that underlie a person’s ability to function as an effective team member. These are described in greater detail below. Specific competencies are provided later in this article.

In general, team effectiveness—a judgment of the quality of a team’s performance outputs—is a function of inputs, processes, and outcomes. Team inputs consist of relatively stable characteristics of the team members (eg, knowledge, attitudes, personality characteristics, demographic characteristics), the task (eg, interdependency with other tasks, tempo), and the environment (eg, physical environment, social or regulatory pressures). As such, some team input factors can be appropriately targeted with training-oriented interventions such as CE, while others cannot be addressed through training. For example, team inputs can be improved by developing team member knowledge and attitudes. Just as basic medical knowledge can improve taskwork performance, knowledge related to the team, the team task and shared goals, and interdependencies among roles can improve teamwork. However, other team inputs (eg, personality traits) are more useful when considering team composition during team formation and selection. While stable individual differences such as personality cannot be directly developed through training in a traditional sense, they are important topics when considering how to compose effective health care teams. Therefore, in integrating elements of team training into CE, developers will also want to consider content dedicated to teaching providers how to compose effective teams and how to vary conflict management styles when working in diverse teams.

CE content dedicated to providing insight on how to compose effective teams has implications for staffing practices, leadership, and patient safety. Team processes refer to the dynamic interactions of team members as they work collaboratively towards a shared goal. Improvement of team processes can be achieved by developing specific behavioral skills or patterns of interaction. This includes such things as communication, leadership, decision making, mutual support, and conflict management. Team outputs are the products of a team’s performance, including task outcomes such as patient outcomes and efficiency of performance, as well as team member satisfaction and viability (ie, the team’s ability to work together effectively in the future). It is not feasible to directly train these types of task-related outputs. Instead, it is necessary to train the team inputs and processes that lead to the desired task outcomes. Changes in team member attitudes, behaviors, and cognitions due to working together are an additional type of team outputs. These can be enhanced by developing team processes such as team learning behaviors, attitudes, and self-correction skills such as debriefing.

The CE community has a great deal of experience developing programs of instruction and metrics for individual-level competencies associated with clinical technical performance, or taskwork; however, teamwork competencies can be held, developed, and assessed at the individual level as well. Enacting these competencies requires a team setting (ie, an individual can’t do teamwork in isolation); however, transportable teamwork ABCs can be developed and assessed at the individual level. In fact, this is the industry standard of practice in the aviation domain. Flight crews do not have stable team membership from one flight to another. Consequently, teamwork skills of crew members are trained and assessed as individuals. This approach has been labeled as developing transportable teamwork competencies because the ABCs developed in an individual team member transfer from one team to the next. The following section expands on this concept and discusses its meaning within CE.
Generic versus Specific Competencies

Teamwork competencies can differ in terms of the degree to which they are tied to specific team members, tasks, or situations, with some teamwork competencies being highly general, and others being much less so. Cannon-Bowers and colleagues distinguished between generic and specific teamwork competencies. These are described below.

Team-specific teamwork competencies are teamwork attitudes, behaviors, and cognitions associated with effective teamwork, but only for a limited range of teams, tasks, or situations. For example, knowledge about the roles of other team members (i.e., shared mental models of team member task responsibilities, a cognition competency) is important for effective team functioning. If everyone on the team understands what everyone else is supposed to be doing, errors during a performance episode can be detected and task assistance provided more effectively. Consequently, this knowledge of team member roles and responsibilities may be considered for inclusion in CE programs. However, the specific roles of team members are different from domain to domain (e.g., ICU team member roles and responsibilities are obviously different from those of an OR team). Additionally, these can vary from facility to facility. For example, trauma teams usually have an explicitly defined set of tasks for each team member, but there is no standard role structure for trauma teams in general. Different facilities may have somewhat different breakdowns of tasks based on differences in the physical layout of the space, organizational policies, or personal preferences of providers.

In contrast, generic—or transportable—teamwork competencies are the ABCs of teamwork associated with effective team performance across different teams, situations, and tasks. For example, closed-loop communication is a pattern of interaction linked to high levels of team performance in many domains. It is defined as the following pattern: A message is sent by an initiator; the receipt of that message is acknowledged by the receiver; and the initiator follows up to confirm correct understanding of the message content. This behavioral teamwork competency ensures that critical information is communicated and understood as intended. This pattern of behavior is not tied to a specific team (i.e., one set of team members) or tasks, but is effective any time important information needs to be shared. When all team members are trained in this behavioral competency (i.e., as both the senders and receivers of information), this type of communication can contribute to effective team performance, whether or not the team members have worked together before. Consequently, it can be labeled as a generic or transportable teamwork competency.

Both generic and specific teamwork competencies have been used in health care teamwork training and education initiatives, and both are appropriate in different situations. Teamwork training programs have been developed for very specific contexts including anesthesia, emergency medicine, and labor and delivery, for example. In these programs, teamwork and taskwork competencies frequently are trained concurrently (e.g., covering the clinical steps of responding to obstetrical emergencies as well as the teamwork behaviors necessary for an effective response). Additionally, teamwork training programs have been developed using generic competencies—ABCs of teamwork that are broadly applicable across different situations. For example, the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) developed jointly by the Agency for Healthcare Research and Quality and the Department of Defense is rooted in a general theory of team performance. Consequently, the competency framework for this program contains primarily generic or transportable ABCs. That is, the competencies in this program—or teamwork tools—are broadly applicable across clinical domains as well as in nonclinical aspects of the health care system (e.g., administration, support staff).

CE must carefully attend to the issue of transportable or generic vs. team- and task-specific competencies when developing curricula. When considering the full continuum of health care education, it is likely that generic teamwork competencies are most appropriate in the early phases of education and become more contextualized and team-specific as learners progress and narrow their focus on their ultimate clinical domain of practice. Additionally, when developing teamwork behaviors throughout a provider’s career, it may be beneficial to develop team-specific competencies explicitly rooted in the more general competencies developed at an earlier stage of education and training. For example, a generic form of structured communication (e.g., SBAR—situation, background, assessment, and recommendation) can be taught as a generic teamwork competency, and more specific versions can be developed and taught for particular situations (e.g., an SBAR with specific content for different types of patients or procedures).

Teamwork Competencies: The ABCs

Decades of teamwork research across a variety of domains and task types has produced a wealth of knowledge about the competencies underlying effective teamwork. A full review is outside the scope of this article, but major ABCs are reviewed below and summarized in Table 1.

Attitudes. Effective teamwork depends on team members possessing a set of attitudes that drive collective behaviors. Specifically, mutual trust, team or collective efficacy, team or collective orientation, and psychological safety are four key attitudes linked to effective teamwork. First, mutual trust is the shared belief among team members that everyone is committed to their responsibilities and seeks to protect the interests of their fellow team members. This attitude is a fundamental driver of coordination, as team members need to believe that they are safe to ask for and provide assistance. Second, collective efficacy is the shared belief among team members that they can accomplish the goals of the team and are confident in their ability to handle the demands of the current situation. Third, team or collective orientation is the shared belief that the team as a whole is more important than any individual team member. Finally, psychological safety is the shared belief that team members can express their opinions and ideas without fear of negative consequences.
TABLE 1. Overview of the ABCs of Teamwork (Attitudes, Behaviors, and Cognitions; Adapted from Salas et al, 2009).

<table>
<thead>
<tr>
<th>ABCs</th>
<th>Definition</th>
<th>Example Citations</th>
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<tr>
<td><strong>ATTITUDES</strong></td>
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<tr>
<td>Mutual trust</td>
<td>The shared belief among team members that everyone will perform their roles and protect the interests of their fellow team members.</td>
<td>Alavi &amp; McCormick, 2004; Driskell &amp; Salas, 1992; Jackson et al, 2006</td>
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<td>Team/collective efficacy</td>
<td>The team members’ sense of collective competence and their ability to achieve their goals.</td>
<td>Bandura, 1986; Gibson, 2003; Katz-Navon, &amp; Erez, 2005; Zaccaro et al, 1995</td>
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<td>Team/collective orientation</td>
<td>Team members’ preference for working with others as opposed to working in isolation.</td>
<td>Alavi &amp; McCormick, 2004; Eby &amp; Dobbin, 1997; Mohammed &amp; Angell, 2004</td>
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<td>Psychological safety</td>
<td>The team members’ shared belief that it is safe to take interpersonal risks.</td>
<td>Edmondson, 1999</td>
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<td><strong>BEHAVIOR</strong></td>
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<tr>
<td>Closed-loop communication</td>
<td>A pattern of information exchange characterized by three steps: a sender initiates a message, the receiver acknowledge the message, and the sender follows up to confirm if it was appropriately interpreted.</td>
<td>Bowers, Jentsch, Salas, &amp; Bruan, 1998; McIntyre &amp; Salas, 1995; Smith-Jentsch, Johnston, &amp; Payne, 1998</td>
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<td>Team leadership</td>
<td>Dynamic process of social problem solving involving information search and structuring, information use in problem solving, managing personnel resources, and managing material resources.</td>
<td>Burke, Stagl, Klein, Goodwin, Salas, &amp; Halpin, 2006; Day, Gronn, &amp; Salas, 2004</td>
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<td>Mutual performance monitoring</td>
<td>Team members’ ability to track what others on the team are doing while continuing to carry out their own tasks.</td>
<td>McIntyre &amp; Salas, 1995; Dickinson &amp; McIntyre, 1997; Marks &amp; Panzer, 2004</td>
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<td>Backup/supportive behavior</td>
<td>The ability to shift and balance workload among team members during high-workload or high-pressure periods.</td>
<td>Marks, Mathieu, &amp; Zaccaro, 2000; McIntyre &amp; Salas, 1995; Porter et al, 2003</td>
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<td>Conflict management</td>
<td>Preemptively setting up conditions to prevent or control team conflict or reactively working through interpersonal disagreements between members.</td>
<td>De Dreu &amp; Weingart, 2003; Jordan &amp; Troth, 2004; Simons &amp; Peterson, 2000</td>
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<td>Mission analysis</td>
<td>Formalizing an understanding of the team’s core tasks, goals, and the conditions under which member’s will function as well as the resources available to the team.</td>
<td>Mathieu, Marks, &amp; Zaccaro, 2001; Mathieu &amp; Schulze, 2006</td>
</tr>
<tr>
<td>Team adaptation</td>
<td>The team’s ability to adjust strategies to changing conditions and learn from past performance episodes.</td>
<td>Burke, Stagl, Salas, Pierce, &amp; Kendall, 2006; Entin &amp; Serfaty, 1999; Kozlowski, Gully, Nason, &amp; Smith, 1999</td>
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<tr>
<td><strong>COGNITION</strong></td>
<td></td>
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<tr>
<td>Accurate and shared mental models (knowledge about team members and role structure, task task, and environment)</td>
<td>Organized knowledge structures of the relationships between task and team members.</td>
<td>Cannon-Bowers &amp; Salas, 1997; Klimoski &amp; Mohammed, 1994; Artman, 2000; Stout, Cannon-Bowers, &amp; Salas, 1996</td>
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<td>Cue-strategy associations</td>
<td>Compatible repertoire of performance strategies or courses of action associated with frequently occurring situations or problems shared among team members.</td>
<td>Cannon-Bowers, Tannenbaum, Salas, &amp; Volpe, 1995; Marks, Mathieu, &amp; Zaccaro, 2001</td>
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members that they are capable of effectively meeting their task demands.\textsuperscript{45} Essentially, this is a sense of confidence and feeling that the team as a whole is “up to meeting the challenges” they face. Without collective efficacy, people may lack motivation to engage in cooperative behavior. Third, collective orientation is the preference for working in a team as opposed to working in isolation.\textsuperscript{46} If team members do not value working in a team, they will be less likely to engage in critical aspects of team performance (eg, they may focus more on the individual components of taskwork and focus less on aspects of teamwork such as communication). Fourth, psychological safety is a type of trust wherein team members share the belief that interpersonal risk taking is safe. This underlies the team’s ability to innovate and learn from past experience.\textsuperscript{47}

\textbf{Behaviors.} A wide range of team behaviors have been linked to effectiveness. These are the actions taken by team members and include such things as communication, leadership, mutual performance monitoring, backup behavior, conflict management, mission analysis, and team adaptation. As described above, closed-loop communication is a pattern of confirming and crosschecking information that ensures messages are received and interpreted correctly.\textsuperscript{35} Team leadership is a broad and complex process including the “ability to direct and coordinate the activities of other team members, assess team performance, assign tasks, develop team knowledge, skills, and abilities, motivate team members, plan and organize, and establish a positive atmosphere.”\textsuperscript{39,p.560} Mutual performance monitoring refers to the team members’ ability to keep track of one another’s work in order to ensure that everything is going as expected.\textsuperscript{48} This enables the team to detect errors or situations in which members need task assistance. The provision of this task assistance when needed is referred to as backup behavior or supportive behavior.\textsuperscript{39} Consequently, mutual performance monitoring and backup behavior go hand in hand, as one is not effective without the other.

Conflict management can be either proactive, wherein conditions to prevent, control, or guide team conflict are established before the conflict occurs, or reactive, wherein task or interpersonal disagreements are worked through to resolution.\textsuperscript{49} Mission analysis is the process of establishing or interpreting the team’s mission, including the identification of major tasks and resources available for completing those tasks.\textsuperscript{50} Team adaptation is a reflective process in which team members’ analyze and change their own performance processes based upon their experiences.\textsuperscript{51} This set of behaviors allows team members to continually improve their performance over time.

\textbf{Cognition.} Team cognition competencies are the declarative (ie, basic factual information) and procedural (ie, knowledge about how to do something) knowledge that allows team members to interact effectively and efficiently in an interdependent manner. This involves shared mental models of the task, team, and environment.\textsuperscript{52} Many of the teamwork knowledge competencies are team- or task-specific. For example, the role structure example described above (ie, knowing the responsibilities and capabilities of different team members) will frequently vary from team to team. In addition to these shared mental models of team roles or structure, cue-strategy associations are an important type of team cognition competency.\textsuperscript{53} These are shared mental models of “what to do when.” That is, when certain environmental or task triggers occur (eg, change in patient status), team members need to have compatible interpretations of these changes and match the situations to performance strategies.

Overall, the ABCs of teamwork offer a foundation from which to generate CE content. The ABCs targeted for training should drive the formation of clear learning objectives that, in turn, drive development of the CE learning experience. Thus, the question then becomes how to train these competencies in highly developed providers who have completed advanced educational training and who have established norms, protocols, and task strategies that strongly shape how they complete their daily work.

\textbf{How to Train: Team Training Strategies for Continuing Education}

The components of training design can be categorized in terms of strategies and methods. Training strategies refer to tools, methods, and content combined to create an instructional approach, whereas training methods describe specific mechanisms (eg, lecture, simulation, etc) through which actual curriculum is delivered.\textsuperscript{54} We first outline several training strategies relevant to CE dedicated to developing critical teamwork ABCs (Table 2). These strategies have been highlighted; however, we remind readers that this list is in no way exhaustive. More in-depth coverage has been provided by Aguinis and Kraiger.\textsuperscript{26}

\textbf{Team Coordination and Adaptation Training}

As one of the comprehensive team training strategies, team coordination and adaptation training (TCT) targets the broadest range of team competencies. Coordination is defined as “the process of interaction that integrates a collection of interdependent tasks;”\textsuperscript{55,p.463} therefore, TCT is dedicated to developing the ABCs underlying the ways team members integrate their individual efforts toward collective patient care goals. TCT often targets transportable competencies such as leadership, communication, resource management, performance monitoring, goal setting, and feedback. Crew resource management (CRM) and anesthesia crisis resource management (ACRM) are arguably the most well-recognized and well-researched forms of team coordination training.\textsuperscript{3,36} Both have integrated simulation-based training delivery methods to facilitate the opportunities for practice that are critical for team learning. CRM and ACRM also focus heavily on aspects of red-flag recognition through mutual
performance monitoring, error mitigation, and management. Educationally, ACRM and similar programs such as emergency medicine crisis resource management (EMCRM) have been evaluated with residents, \textsuperscript{37} nurse practitioners, \textsuperscript{56,57} and advanced medical students. \textsuperscript{58} The TeamSTEPPS program introduced earlier in the article is another form of team coordination training that has successfully been awarded CE for front-line providers. \textsuperscript{59} Recent meta-analyses suggest that TCT strategies account for approximately 20% of the variance in team performance in the published literature. \textsuperscript{18,21}

**Leadership Training**

Another training strategy relevant for clinicians is leadership training. Care models such as the Chronic Care Model\textsuperscript{60} and the emerging concept of the “medical home”\textsuperscript{61,62} demand that physicians develop as leaders, not simply commanders of patient care teams. Leadership is defined as a multidimensional influence process among leaders and followers who intend real changes that reflect their mutual purposes. \textsuperscript{53} This is an important distinction that differentiates leadership competencies from positions or titles of power. \textsuperscript{64}

While a diverse range of activities fall under within the category of leadership training, leadership development efforts often targets skills such as communication, delegation, decision making, and the experience of “high-impact” events. Such programs often also include coaching and mentoring skills, as well as concepts related to self-awareness and introspection. \textsuperscript{65} The evidence to date clearly shows that effective leaders capitalize on their own personal strengths and continually work to overcome their own shortcomings; therefore, efforts to develop leadership skills often include 360-degree feedback, action learning, and developmental assessment centers dedicated to helping trainees reflect on their own personal leadership style and skills. For example, transformational leadership training strategies\textsuperscript{66} focus on developing four critical competencies: (1) idealized influence (eg, modeling behavior which followers desire to emulate), (2) inspirational motivation (eg, demonstrating a strong vision for the future based on goals/ideals), (3) individual consideration (eg, active engagement in individual follower development and interests), and (4) intellectual stimulation (eg, challenging followers to question the status quo and supporting creativity). Opportunities to develop and maintain such skills are important aspects for CE to address. Overall, meta-analyses show that leadership training is effective. For example, a review spanning nearly 100 years of leadership intervention research showed that participating in a leadership training/development program accounted for nearly 31 percent of the variance in targeted outcomes. \textsuperscript{67}

**Team Self-Correction Training**

Team self-correction focuses on building team adaptability into practice so that teams can reflect upon and modify their strategies appropriately as contextual and situational factors evolve. \textsuperscript{68} Using a method dedicated to deliberate practice of facilitated debriefings, this strategy focuses on teaching team members to move away from a singular focus on the task-oriented aspects of performance (eg, strategy), to identify aspects of the coordination processes (1) that went well, (2) that could be improved, (3) to think critically about the factors and processes that helped or hindered optimal performance, and (3) to operationalize and implement specific ways to support optimal performance. \textsuperscript{69} Furthermore, trainees learn how to facilitate such debriefings in the field themselves in order to diagnose and realign team efforts in real time. During training sessions, a facilitator actively guides the trainees through a structured debriefing process by focusing the discussion, promoting a climate of learning, eliciting comments from all members, and demonstrating how to provide effective feedback. \textsuperscript{70} The goal is to teach team members core basic skills—such as assertiveness, information sharing, and deference to expertise—and also to teach them how to facilitate such debriefings themselves, in order to self-correct without the need for outside intervention. Additionally, meta-analytic results indicate that team self-correction training strategies to account for up to 37% of the variance in team performance. \textsuperscript{18,21}

**Guided Error Training**

The notion of “perfect practice” has been a cornerstone of the traditional education model in health care. However, empirical evidence in the training and adult education literature demonstrates that the inclusion of errors in training provides meaningful feedback that leads to greater learning and transfer as compared to error avoidance training. \textsuperscript{71} Near misses or errors that do not result in patient harm are easy to miss, because they are often weak signals among the din of daily practice demands, disregarded as part of normal operations, or not perceived as potential threats because providers simply are not trained to identify or pay attention to such minute anomalies. \textsuperscript{72}

Guided error training (GET) and error management training (EMT) are methods for allowing advanced learners to experience what these close calls actually feel like in a safe environment, with guidance designed to help develop skills to manage and recover from small misses or actual errors. Specifically, GET is designed to actively lead trainees into errors and support error correction efforts. Thus trainees have the opportunity to learn and practice corrective strategies for dealing with potential error pathways and methods for mitigating small lapses so that they do not manifest into full-blown errors or otherwise negative outcomes. GET has been found to lead to greater performance as well as increased self-efficacy, \textsuperscript{73} a critical component of motivation. Allowing trainees to see what errors look like, what outcomes can result from errors, and the appropriate corrective action to take is invaluable experience that can lead to expertise in increased efficacy with error management as well as the ability
to self-correct when errors do indeed occur. Both skills are important for creating and maintaining safety culture.

When using guided error training, however, it is important to consider that formative assessments conducted during GET events will likely show lower performance levels, considering that the premise of this strategy is to induce performance error to allow for practice of mitigation and error management techniques. For example, an analysis of 24 studies showed that overall error management training had a positive effect on performance; but it had a larger effect on measures of post-training transfer than within-training performance.²⁴

### How to Train: Team Training Methods

While training strategies refer to overarching curriculum design and orchestration, training methods refer to the actual mechanisms through which content is delivered. Generally, these methods can be categorized based on their specific purpose: (1) to provide information, (2) to demonstrate targeted competencies, or (3) to provide opportunities for practice and feedback.⁵⁴ Information-based methods include lectures, presentations, and some types of computer-based learning. These methods provide a baseline level of declarative knowledge to learners and are, by far, the most commonly available form of CE. They are easy to implement, efficient, and cost-effective for both developers and participants. However, as a passive means of learning, empirical data indicate that information-based training methods alone often have minimal impact on actual behavior or attitude change. For example, a review of 160 CE interventions found the least supportive evidence for the effectiveness of information-only CE methods (eg, formal conference presentations)—those that did not include opportunities for deliberate practice with feedback.²²,²³ Examples of this type of CE abound, from the 5000-member annual meetings of societies such as the American College of Physicians to the weekly research conferences held at most academic medical centers. While there may be some utility in developing declarative knowledge regarding teamwork through these one-way exchanges of information, there is little evidence that such mechanisms on their own will lead to meaningful changes in practice.

Demonstration-based training methods provide opportunities for trainees to observe, hear, and sense concrete examples of targeted competencies.²⁵ While trainees still are not directly enacting these competencies, demonstration is a critical component of adult learning that allow trainees to see contextualized examples. Multiple learning objectives can be embedded into a single demonstration and trainees can be exposed to both positive and negative exemplars. Desired ABCs can be modeled in a way that provides learners with a template to employ targeted competencies in their daily work, thus motivating transfer of training. Examples of this type of CE might range from demonstration workshops on dermatology procedures for the family medicine provider to on-stage role-plays showing providers how to best obtain patient buy-in for behavior changes. Skills demonstrations such as these would allow for providers to see the skills-based learning objectives, such as the use of SBAR, in action.

The most critical learning methods, however, are practice-based. Practice can involve role-playing, computer-based simulation, and guided practice. Although practice is a crucial instructional methodology, it is often misused and not well understood in the field. Effective practice is structured, scaffolded, incorporates variability, and guides learners to engage in self-monitoring and self-regulatory behavior.²⁶ Though its ultimate end goal is change in daily practice, CE has historically been less likely to be structured in this fashion, partly for the financial and logistic reasons previously mentioned. However, many continuing education accreditation agencies are pressing CE providers to utilize these methods more frequently. This move has been driven partly

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**TABLE 2. Examples of Relevant Instructional Strategies for Teamwork-Focused CE. (Adapted from Weaver & Salas, 2009)**

<table>
<thead>
<tr>
<th>Instructional Strategy</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team coordination training</td>
<td>Focuses comprehensively on competencies underlying effective teamwork, such as communication, leadership, mutual performance monitoring, and near-miss or error management.</td>
</tr>
<tr>
<td>Team self-correction training</td>
<td>Training strategy built around guided team debriefings. Trainees learn how to perform (and lead) structured briefings and debriefings that have been demonstrated to significantly improve team performance on complex tasks, under opaque and dynamic conditions.</td>
</tr>
<tr>
<td>Leadership training</td>
<td>Strategy focused on developing ABCs underlying effective delegation, decision making, communication, and resource coordination. Focuses on leadership as a reciprocal process of influence as compared to a command hierarchy or individual characteristic.</td>
</tr>
<tr>
<td>Error training</td>
<td>Allows practitioners to experience errors in a contrived environment, exposes them to the consequences, and provides the opportunity to test out strategies for mitigation and management.</td>
</tr>
</tbody>
</table>
by the recognition that practitioners, like all adult learners, are more likely to transfer new skills to the workplace if they have had a chance to practice them. As a result, there is an ever-increasing number of practice-based CE offerings. Examples include surgical workshops, allowing attendees to practice minimally invasive techniques in a simulation lab, and meetings on effective utilization of behavioral modification techniques. Educators and training designers must consider how to build elements of interprofessional practice of targeted ABCs into curriculum design.

Simulation offers a unique opportunity to achieve this goal. For example, several simulation-based team training programs have been developed targeting interprofessional obstetrical teams.76,77,78 While such high-fidelity simulations and in-situ simulation using wireless mannequins offer ideal mechanisms for immersion, opportunities for practice in team-based CE can be as simple as role-playing. The critical aspect of practice is not its degree of physical fidelity, but its degree of cognitive fidelity—the extent to which the cognitive, affective, and behavioral processes trainees engage in during the training process mirror those they will use on the job. Similarly, CE developers must look to alternative forms of developmental activities, such as coaching, mentoring, blended learning opportunities that combine virtual computer-based learning opportunities with opportunities for practice and feedback79 and communities of practice,80 which facilitate ongoing peer-to-peer communication and learning.

**How to Measure and Assess Teamwork Competencies**

Measurement is a fundamental component of any educational or training program. Instructional programs targeted at developing teamwork competencies are no exception. This section provides an overview of the decisions that must be made when developing a measurement system to assess teamwork competencies.81,82

**Fundamentals of Measuring Teamwork**

There has been much progress in the development of reliable and valid team performance measurement systems for health care in recent years.82–84 However, there are still no ready-made solutions to team performance measurement in health care, particularly for the purposes of CE. Consequently this section reviews some of the major decisions that must be made in the development of a team performance measurement system with a focus on the specific context of CE (for a more detailed discussion of these decisions, see Rosen et al78).

**Purpose: Why Measurement is Being Conducted.** Defining the purpose is the first and most basic step of designing any measurement system. However, it is also the one that must frequently be answered implicitly. A clear and explicit articulation of the purpose is critical to managing the tradeoffs inherent in developing any team performance measurement system. General reasons to measure teamwork include selection of good “team players,” certification or assessment, evaluation of training and educational programs, research, and providing feedback for learning. Different measurement strategies may be used to meet each of these purposes, as different methods will produce data better suited for answering different types of questions.76 For example, a high degree of behavioral specificity is necessary to create diagnostic measures capable of providing the detailed process-oriented feedback necessary to improve teamwork in training.85 However, more generic measures (eg, global ratings scales) may suffice when assessment or certification is the primary purpose.

Integrating measurement of teamwork into CE poses challenges. Most notably, and as described earlier, teamwork is a group-level phenomenon (ie, it is something that only happens in a group setting) and CE has traditionally focused solely at an individual level. If the purpose of measurement is to assess teamwork competencies in an individual, then high degrees of control over other aspects of the team are necessary (ie, the teamwork demands placed on the individual as well as fellow team member responses).

**Content: What to Measure.** There are two major considerations when specifying the content of a measurement system for teamwork in CE. First, in any education or training program, the content of a measurement system should align with the competencies being trained—in this case, the ABCs of teamwork. Any CE activity should have explicit learning objectives linked to some teamwork competencies. The learning objectives for a given activity drive the content of the measurement tools. Second, one of several broadly used multilevel evaluation models can be used to further develop the content of the measurement system. This includes: (1) the Kirkpatrick model and its extensions,86,87 delineating learner reactions, learning, behavior change, and organizational results, (2) Bloom’s updated taxonomy,88 and (3) the context, input, process, product (CIPP) model of program evaluation.89 For example, distinctions between learning and behavior change in the Kirkpatrick model highlight the need to assess both the degree to which team members are acquiring the targeted competencies (ie, learning) and the degree to which they apply those competencies in their daily practice (ie, behavior change).

**Method: How to Measure.** The two primary methods of capturing teamwork competencies are self-report and observation. While there are notable and widely reported problems with self-report methods (eg, inflated perceptions of competence90), surveys can be useful for measuring attitude and cognitive teamwork competencies. However, observation is the gold standard for measuring teamwork behaviors, especially behavioral competencies. Several different types of observational scales are used for team performance
measures including global ratings scales, behaviorally anchored ratings scales (BARS), behavioral observation scales (BOS), and event-based measures. These different methods vary in their behavioral descriptiveness of team processes as well as in the degree to which they require observers to make judgments or summate their ratings across time. Different rating tools can be more or less challenging to train and achieve high levels of reliability; however, any observational measurement system requires a plan for developing and monitoring inter-rater reliability, including rater training and support tools such as scoring guides.

**Location: Where Measurement is Occurring.** The location of measurement can have strong implications for designing a measurement system. There are at least three types of locations common for team performance measurement: in a learning environment (ie, space and time dedicated exclusively to education or training such as a classroom or dedicated simulation facility), on the job, or in hybrid locations such as in-situ simulation. These locations differ in terms of the amount of control over the teamwork demands that is possible, ranging from near complete control in learning environments, no control on the job, and somewhere in between in hybrid environments. Having a high degree of control affords the ability to create opportunities to measure specific teamwork competencies by creating critical events or demands that require a targeted teamwork response. However, observation on the unit allows for true assessment of behavior change and transfer of learning to the job, and not just the degree to which learners have acquired the skills. This difference between learning and behavior change is critical, as there are often many organizational barriers that can interfere with the transfer of competencies acquired in education and training from the learning environment to the job. In-situ simulations are practice-based learning and assessment opportunities conducted on the actual unit. While these activities do not provide the same degree of control that a dedicated simulation facility does, they provide a promising compromise between standardizing measurement opportunities while including the realism of the unit.

**Integrating Team Training into CE: A (Proposed) Roadmap**

Just as evidence-based clinical algorithms and best practices are contextualized based on individuation in patient disease processes, so too must the principles of effective team training be molded to best fit the context of CE in health care. Our *lessons for practice* summarize 10 recommendations for integrating team training into CE opportunities. These recommendations focus on elements of training design. However, they are couched in recognition that CE does not occur in a vacuum. We support previous calls emphasizing that to achieve the core outcomes of continuing education—optimized daily practice and patient outcomes—the integration of team training concepts must be approached from a systems perspective; the social, environmental, and task factors with the potential to help or hinder transfer of teamwork competencies into daily practice must be considered before, during, and after dedicated CE experiences. A fundamental first step for CE programs is to start by immediately laying an explicit foundation regarding the value teamwork provides directly in patient care and in the daily working experiences of providers themselves. For team-training based interdisciplinary CE to achieve effectiveness, it must be recognized and supported by professional associations across the disciplinary spectrum. Additionally, administrators must actively invest in such CE opportunities for their staff and reinforce effective teamwork in daily practice. Practicing providers must also have mechanisms to analyze their own performance as care team members and identify opportunities for learning and continuous development.

During CE activities, instructional approaches must offer opportunities for practice and constructive feedback. Facilitators must create a psychologically safe, learning-oriented environment in which providers can openly speak up with questions and their own contributions. Content must consider issues directly related to transfer of training, spurring participants to actively develop a plan for how to best integrate or refine targeted team competencies in their daily practice, as well as potential barriers and ideas on how to appropriately handle them. Participants must know about and practice using mechanisms in place to support and reinforce adoption of CE concepts. Additionally, facilitators must underscore the role of the patient as an active team member in the team learning process and address how participants can actively communicate and develop a psychological contract of quality and safety with their patient team members. Teamwork skills cannot be divorced from relevant clinical skills; however, CE efforts focused on teamwork competencies must be careful to ensure clinical complexities of the case do not overshadow focal team concepts, especially during feedback and self-assessments. Practice scenarios should be scaffolded in complexity to build increasingly rich and complex opportunities for practice that map to the learner’s current proficiency level.

From an evaluation standpoint, teamwork-oriented CE must be evaluated with the same rigor as more traditional accredited technical skill programs and its estimated effects on provider and patient outcomes reported. Evaluation is a continuous process, occurring before (need analysis), during (formative assessment), and after (summative assessment) formalized CE activities; therefore, support and resources must be available for all aspects of the measurement continuum. To achieve meaningful levels of effectiveness and expedite the transition of the state-of-the-art science of teamwork into practice, CE cannot rest on passive learning methods or single-level evaluation efforts.
Lessons for Practice

- Lay the foundation for a unified approach to teamwork.
- Train a multidisciplinary, interprofessional cadre of faculty, instructors, and coaches how to effectively facilitate the development of teamwork competencies.
- Root curriculum design and implementation in established principles of training and adult learning.
- Train team-based CE opportunities using team-based learning activities that engage providers from multiple disciplines.
- Incorporate team skills in a practical way with multiple, varied opportunities for practice.
- Practice what you preach: Ensure CE facilitators and instructors represent multiple disciplines.
- Do not divorce team competencies from technical skills, but focus on teamwork competencies during debriefings and discussions. Do not let teamwork get lost in a discussion of technical approach.
- Contextualize examples, learning materials, etc. to the clinical context to facilitate cognitive fidelity of the CE experience.
- Diagnostically measure teamwork competencies during CE to provide directed diagnostic feedback.
- Reinforce effective teamwork in daily practice.

Summary and Conclusions

We have attempted to outline several considerations for the development, implementation, and evaluation of CE programs dedicated to enhancing core teamwork competencies. Teamwork and an underlying culture of safety are critical components of safe, effective, and efficient care. Furthermore, with a firm foundation in the attitudes, behaviors, and cognition (ABCs) necessary to act as expert team members, clinicians are poised to create a more positive working environment for themselves, their colleagues, and patients.

We emphasize, however, that even the most comprehensive and well-designed team-oriented CE programs will fail unless they are supported by an organizational and professional culture that value collaborative behavior. We echo the recommendations of the Lucian Leape Institute2 that:

As part of continuing education and ongoing performance improvement, medical school deans and teaching hospital CEOs should provide incentives and make available necessary resources to support the enhancement of faculty capabilities for teaching students how to diagnose patient safety problems [including teamwork related issues], improve patient care processes, and deliver safe care.

The new era of health care demands a new approach to health care education in the classroom, simulation center, and beyond. Continuous quality improvement demands a range of elements that includes continuing interprofessional education and a commitment to ongoing, (often) less formalized interprofessional learning within everyday work.28,97 While integrating team concepts early in undergraduate and graduate education is critical, the CE of faculty and practitioners already in the field will directly impact the extent to which newly developing providers transfer and generalize team skills into their daily practice. Just as it is crucial for providers to continue lifelong learning of technical clinical skills, opportunities to learn, practice, and refine nontechnical teamwork aspects are foundational to truly evolutionary transformation in health care.

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