7-14-2008

Promoting Teamwork: An Event-Based Approach to Simulation-Based Teamwork Training for Emergency Medicine Residents

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Scholarly Commons Citation

Rosen, M. A., Salas, E., Wu, T. S., Silvestri, S., Lazzara, E. H., Lyons, R., Weaver, S. J., & King, H. B. (2008). Promoting Teamwork: An Event-Based Approach to Simulation-Based Teamwork Training for Emergency Medicine Residents. *Academic Emergency Medicine, 15*(11). https://doi.org/10.1111/j.1553-2712.2008.00180.x

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Abstract

The growing complexity of patient care requires that emergency physicians (EPs) master not only knowledge and procedural skills, but also the ability to effectively communicate with patients and other care providers and to coordinate patient care activities. EPs must become good team players, and consequently an emergency medicine (EM) residency program must systematically train these skills. However, because teamwork-related competencies are relatively new considerations in health care, there is a gap in the methods available to accomplish this goal. This article outlines how teamwork training for residents can be accomplished by employing simulation-based training (SBT) techniques and contributes tools and strategies for designing structured learning experiences and measurement tools that are explicitly linked to targeted teamwork competencies and learning objectives. An event-based method is described and illustrative examples of scenario design and measurement tools are provided.

ACADEMIC EMERGENCY MEDICINE 2008; 15:1190–1198 © 2008 by the Society for Academic Emergency Medicine

Keywords: teamwork, simulation-based training, event-based measurement

Medicine is a team sport—Atul Gawande, MD

Emergency medicine (EM) residency programs have traditionally done an outstanding job developing curricula to teach and evaluate medical knowledge and patient care. However, the teamwork, communication, and leadership components of the ''interpersonal and communication skills'' (ICS) competency pose unique challenges to traditional methods of training and assessment in healthcare. The Accreditation Council for Graduate Medical Education (ACGME) has established the six core competencies that currently guide the development of residency curricula. While working effectively with others as a member or leader of a health care team or other professional group is an objective of the ICS competency, ''teamwork'' was not included explicitly as one of these core competencies. However, teamwork is integral to the practice of EM. There are tools, strategies, and methods currently available that address the goal of graduating emergency physicians (EPs) who are good team players; however, more are needed. Consequently, developing sound methods for training and evaluating these skills will enhance EM curricula. To that end, this article presents an event-based approach to developing simulation scenarios and measurement tools for training and assessing teamwork skills in EM residents.

This article outlines how an event-based approach to training (EBAT) and measurement[1] can be applied to training and assessing teamwork skills in EM residents. Specifically, this article addresses three goals. First, we discuss the rationale for incorporating teamwork training into EM residency curricula and why simulation-based training (SBT) is a preferred methodology for delivering teamwork training. Second, we discuss a general methodology, EBAT, for systematically developing training scenarios and measurement tools that are linked to competencies targeted for training. This methodology has been successfully applied to training teamwork skills in other domains (e.g., the military and aviation[2–4]) as well as to training individual-level ACGME core competencies[5,6] and provides many solutions to the challenges of using SBT to train teamwork skills. Third, we present a contextualized EBAT method for

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Received March 3, 2008; revision received April 7, 2008; accepted April 27, 2008.

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ISSN 1069-6563
PII ISSN 1069-6563583

doi: 10.1111/j.1553-2712.2008.00180.x

creating simulation scenarios and measurement tools for training EM residents. Medicine has been described as a ''team sport,'' except that there are no coaches in medicine.[7] Rigorous and systematic methods for delivering SBT like the one described in this article can enable the coaching of teamwork skills through guided practice.

SBT FOR TEAMWORK IN EM: RATIONALE AND CHALLENGES

There is a premium on the time of EM residents. With resident duty-hour limitations and the ever-increasing amount of knowledge for which EPs are responsible, the allotment of time to any given learning experience must be justified. This raises two important questions for incorporating teamwork training into a residency program. First, is teamwork training a valuable and necessary addition to the educational experiences offered by a residency program? If the answer is yes, a second question arises: what is the most efficient means of incorporating teamwork training into residency? These questions are addressed in the following sections.

Why Train Teamwork Skills in EM Residency Programs?

Teamwork skills such as communication, coordination, and cooperation are critical to patient safety in that they serve as barriers to error in patient care.[8] Training these skills in EM residency programs is especially important due to the complex and often time-pressured nature of patient care in EM. In the emergency department (ED), the care environment is inherently challenging—undifferentiated patients in a rapidly and continually changing environment. This challenge is coupled with intense time pressures, vast amounts of information coming from multiple sources, and a clear knowledge that the consequences of errors are extremely high.[9,10] Furthermore, patient encounters in the ED are unique. As noted by Hobgood and colleagues,[11] they frequently consist of a single encounter with a new and unknown patient, consisting basically of an interaction by two strangers in a chaotic and emotionally charged environment. Under these pressures, EPs must quickly establish rapport with the patient, perform a detailed assessment, create a plan of care, and most importantly, communicate the findings and plan of care to other care providers, the patient, and the patient's family. Considering that communication failure is cited as the root cause of nearly 70% of the sentinel events reported to the Joint Commission, there is strong evidence that even the most skilled and clinically competent physicians can falter when their communication skills are lacking.[12]

By creating the ICS competency, the ACGME formally recognized this issue and ruled that these skills are universal requirements in resident education. Furthermore, a close inspection of other core competencies highlights the interdependent nature of the EP's role and further highlights the need for systematic teamwork training. For example, as a part of the patient care competency, residents are required to communicate effectively with patients and their families (reflecting the teamwork competency of communication) and, as a part of the practice-based learning and improvement core competency, they must facilitate the learning of other students and professionals (reflecting teamwork competencies of leadership and mutual support). So, the impetus for incorporating teamwork training into EM residency is clear. It is a core component of an effective EP's skill set and serves as a means to help manage the complexity of patient care.[13]

How Do You Train Teamwork Skills in EM?

Although the value and criticality of training EM residents to be good team players is salient, a formal procedure has yet to be established for the development of such skills. As previously noted, ICS is the primary ACGME competency that addresses skill training relevant to teamwork. Thus far, the ICS competency has been trained most often using information-based learning strategies (e.g., lecture, literature) and exemplary role modeling.[14] However, teamwork knowledge in and of itself is not sufficient for preparing EM residents to apply such skills under the dynamic, stressful, high-consequence conditions encountered on the job. Rather, the literature on teamwork training has indicated, across a variety of domains (e.g., aviation, military), that effective teamwork training should incorporate structured practice and feedback and avoid relying on the mere provision of information.[15,16] SBT has proven to be an effective methodology for training complex team skills.[17]

In recent years, SBT has become an increasingly prevalent method for training within health care domains and has specifically been recommended for EM training.[18] Related to the training of teamwork skills, SBT affords several benefits beyond those of non–practice-based methods. First, simulations provide an engaging, high-fidelity learning environment that emulates the tasks and equipment encountered on the job. Such training environments provide an opportunity for practicing dynamic teamwork skills. Practicing in an environment that replicates the performance environment increases the likelihood that the trained teamwork skills will transfer to the job.[19] Second, such methods serve as a safe environment for learning without the risk of patient harm. By removing the potential for high-stakes errors during training, residents can comfortably experiment and familiarize themselves with the teamwork skills before applying them in clinical practice where the consequences for errors can be high. When errors do occur, simulations allow for immediate feedback to maximize learning. Third, the adaptability of medical simulations allows the learning experience to be tailored to meet systematic training objectives. The curriculum is not solely dependent on the available patient population.

So, SBT is a powerful tool for developing teamwork skills; however, there remain challenges to developing effective SBT for teamwork. Practice alone is not sufficient; practice activities must be structured and guided. Additionally, performance must be measured to ensure the correct knowledge, skills, and attitudes (KSAs) are acquired. In the following section, we discuss several of the most difficult challenges to accomplishing these goals, and subsequently we discuss methodologic solutions.

Table 1
Summary of Connections between Teamwork Competency of Leadership, Learning Objectives, KSAs, Critical Events, and Targeted Responses

Teamwork Competency	Learning Objectives	Clinical Context
Team leadership: To maximize patient care and safety, physicians, nurses, pharmacists, technicians, and other ancillary staff members must coordinate their activities and function effectively as a team. Safe and efficient patient management requires residents to function as a team leader during the multidisciplinary approach to patient care.	• Demonstrate team leadership skills by directing and coordinating the activities of other team members, assessing team performance, assigning tasks, motivating team members, and organizing and executing management plans. • Develop common understandings of the team environment and apply appropriate task strategies to accurately monitor team performance. • Anticipate other team members' needs through accurate knowledge about their responsibilities and redistribute workload among members to achieve balance during high-pressure situations. • Adjust strategies based on information gathered from the environment through the use of compensatory behavior and reallocation of intrateam resources. • Alter the management plan or team repertoire in response to changing conditions (internal or external). • Anticipate and predict the needs of other team members. • Exchange information in a clear and precise manner. • Follow-up and ensure that the message received was the message intended.	ED resuscitation

BVM = bag/valve/mask; ECG = electrocardiogram; ED = emergency department; $ETCO_2$ = end-tidal carbon dioxide; ETT = endotracheal tube; IV = intravenous line; KSA = knowledge, skills, and attitudes; RN = nurse; SBAR = situation-background-assessment-recommendation; STEMI = ST-segment elevation myocardial infarction.

Challenges to Implementing SBT for Teamwork

Although the criticality of teamwork training for EM residents is clear, there are several issues that complicate the development of effective SBT for teamwork. The first challenge is rooted in the multilevel nature of teamwork (e.g., it is a property of the team, but rooted in the performance of team members). Teamwork involves the interactions of highly skilled individuals with expertise in their individual disciplines working together. Team members are heterogeneous in their roles and abilities; however, they must come together to achieve common and valued goals. Teamwork is not a constant; it is influenced by numerous factors including characteristics of the clinical situation and environment, team composition, and trust among members, to list but a few.

The second challenge is rooted in the dynamic nature of teamwork; that is, teamwork involves performance over time. Therefore, teamwork training requires opportunities for realistic practice-based learning experiences. Rosenzweig and colleagues[20] conducted a survey of EM residency programs and found that ICS curricula mainly consisted of classroom-based lectures, workshops, journal clubs, and problem-patient conferences. While these methodologies are beneficial in imparting knowledge of effective communication and interpersonal skills, they do not offer opportunities for guided practice. Guided practice with immediate and constructive feedback is crucial to developing teamwork skills and systematically engineering practice activities so that opportunities to learn are maximized is a resulting challenge.

This raises the third challenge—performance measurement. SBT requires the design and use of valid and reliable measurement tools to provide diagnostic and

KSAs	Sample Critical Events	Sample Targeted Responses
1. Identifies and declares him-/herself as the team leader during the resuscitation. 2. Observes and helps direct activities of other team members. 3. Synthesizes all available data and formulates a treatment plan. 4. Responds appropriately to changes in the patient's status via reallocation of team resources	55-year-old male is visiting another ED patient and suddenly collapses. The resident is called into the room, but the RN begins yelling out orders. *(KSA 1)*	1. The resident identifies him-/herself as the team leader. 2. Establishes unresponsiveness. 3. Opens the airway (jaw thrust and chin lift). 4. Inspects for chest rise and fall. 5. Listens for air movement from the mouth. 6. Feels for a pulse. 7. Resident calls for/activates a ''CODE'' to recruit more team members to help.
5. Identifies mistakes and lapses in other team members actions and provides constructive corrective feedback.	The patient remains apneic and pulseless. The confederates just stand at the patient's bedside awaiting direction/orders. *(KSA 2)*	1. Asks for the RN to put the patient on a cardiac monitor and for an IV to be secured. 2. Asks for the ED tech to begin chest compressions.
6. Communicates the situation, background, assessment, and recommendations in a succinct and accurate fashion during signout.	The ED RN states ''Do you want me to put the patient on a monitor, put in an IV, or bag the patient? There's only one of me!'' *(KSA 2)*	1. Asks the RN to place the patient on a monitor first and then to work on securing an IV. 2. Begins bagging the patient him-/herself.
	ED tech performs very shallow chest compressions at 40/minute. *(KSA 5)*	1. Educates the ED tech on how to perform appropriate chest compressions (identify the xiphoid process and lower third of sternum, interlock hands, perform chest compressions at a depth of approximately 1.5 to 2 inches at a rate of 100/minute).
	ED tech suddenly stops performing chest compressions because he/she is ''too tired to continue.'' An ED tech arrives simultaneously. RN states that she is having a hard time maintaining a seal on the BVM. *(KSA 4)*	1. Directs another team member to take over chest compressions. 2. Directs the RN to take over BVM ventilation and asks the ED tech to prepare the intubation equipment (or vice versa).
	The patient is successfully intubated and the RN starts yelling at the ED tech and accusing him/her of dislodging the ETT in the process of securing it. *(KSA 3 and 5)*	1. Inquires about the $ETCO_2$ reading. 2. Identifies the alveolar waveform demonstrated on capnograph. 3. Auscultates the chest and epigastric region. 4. Reassesses the pulse oximetry reading and waveform.
	Once the patient is stabilized, an ECG is performed showing an STEMI in the anterior and lateral leads. *(KSA 3 and 6)*	1. Resident summarizes the case, management rendered, and recommended course of action/catheterization to the cardiologist on-call (SBAR format).

corrective feedback, and designing these measures can be challenging. Training sequence and structure can be optimal in SBT, but in the absence of performance measurement, learning opportunities are surely lost. Because performance in SBT closely replicates the complexity of performance processes used on the job, there is the possibility of encountering the same performance measurement issues involved in measuring performance on the job (e.g., criterion contamination, deficiency).[21]

In sum, teamwork training is a valuable addition to a resident's learning experiences. However, to effectively and efficiently incorporate teamwork training, a residency program must address several challenges. It must address the multilevel and dynamic nature of teamwork skills, as well as afford diagnostic measurement of complex practice-based performance. In the following section, we present a general approach developed to meet these challenges as well as a recent application of this approach to training individual-level competencies in EM residents.

EBAT

To maximize the effectiveness of practice activities, the EBAT methodology draws on the science of training to create scenarios and performance-measurement tools that directly link the content of the scenario with the competencies being trained.[1] This is accomplished by systematically identifying and introducing critical events into practice-based activities. These events provide known opportunities to observe behaviors linked to the learning objectives. Following the EBAT process results in standardized and structured learning experiences where explicit links between the training or

Table 2
Observational checklist for example scenario. 'Hits' are a dichotomous scoring of whether or not the targeted behavior was observed

Simulation Scenario:
ED Resuscitation
Teamwork Competency: Leadership

Event	Critical Response	Hits	IG*
55-year-old male is visiting another ED patient and suddenly collapses. The resident is called into the room, but the RN begins yelling out orders.	The resident identifies him-/herself as the team leader. Establishes unresponsiveness. Opens the airway (jaw thrust and chin lift). Inspects for chest rise and fall. Listens for air movement from the mouth. Feels for a pulse. Resident calls for/activates a ''CODE'' to recruit more team members to help.		
The patient remains apneic and pulseless. The confederates just stand at the patient's bedside awaiting direction/orders.	Asks for the RN to put the patient on a cardiac monitor and for an IV to be secured. Asks for the ED tech to begin chest compressions.		
The ED RN states ''Do you want me to put the patient on a monitor, put in an IV, or bag the patient? There's only one of me!''	Asks the RN to place the patient on a monitor first and then to work on securing an IV. Begins bagging the patient him-/herself.		
ED tech performs very shallow chest compressions at 40 per minute.	Educates the ED tech on how to perform appropriate chest compressions (identify the xiphoid process and lower third of sternum, interlock hands, perform chest compressions at a depth of approximately 1.5 to 2 inches at a rate of 100/minute).		
ED tech suddenly stops performing chest compressions because he or she is ''too tired to continue.'' An ED tech arrives simultaneously. RN states that she is having a hard time maintaining a seal on the BVM.	Directs another team member to take over chest compressions. Directs the RN to take over BVM ventilation and asks the ED tech to prepare the intubation equipment (or vice versa).		
The patient is successfully intubated and the RN starts yelling at the ED tech and accusing him/her of dislodging the ETT in the process of securing it.	Inquires about the $ETCO_2$ reading. Identifies the alveolar waveform demonstrated on capnograph. Auscultates the chest and epigastric region. Reassesses the pulse oximetry reading and waveform.		
Once the patient is stabilized, an ECG is performed showing an STEMI in the anterior and lateral leads.	Resident summarizes the case, management rendered, and recommended course of action/catheterization to the cardiologist on-call (SBAR format).		

BVM = bag/valve/mask; ECG = electrocardiogram; ED = emergency department; $ETCO_2$ = end-tidal carbon dioxide; ETT = endotracheal tube; IV = intravenous line; RN = nurse; SBAR = situation-background-assessment-recommendation; STEMI = ST-segment elevation myocardial infarction.
*IG = instructor-guided, used when the behavior is observed, but was coached by a trainer.

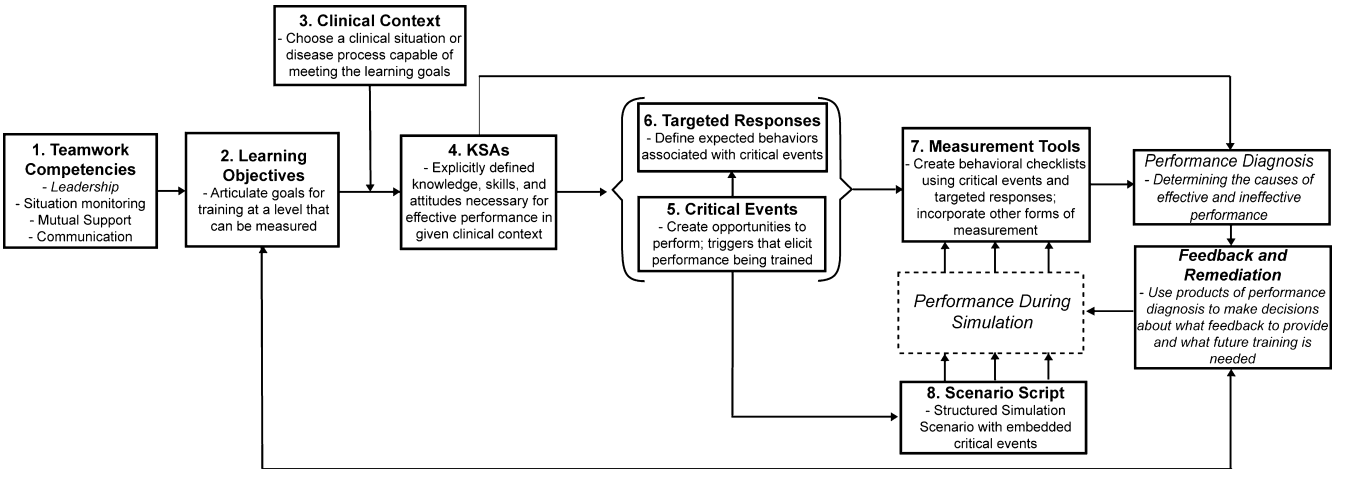

Figure 1. Overview of event-based approach to training (EBAT) process for teamwork training in emergency medicine (EM). KSA = knowledge, skills, and attitudes.

learning objectives, the structure and content of the practice activity, and performance assessment are maintained. EBAT has been successfully applied to teamwork training in aviation[2] and military domains,[3,22] in part because it addresses the three challenges previously stated. First, EBAT can be used to evaluate a team as a unit or the teamwork competencies of an individual. Because EM residents work with many different team members, the focus is on training ''team-generic'' or transportable teamwork competencies.[23] That is, teamwork skills can be trained in an individual resident that can then be applied in different team situations. Second, because EBAT focuses on scripted events and observable behaviors, it is capable of capturing the dynamic nature of teamwork. It affords dynamic practice opportunities and the assessment of team performance over time. Third, measurement tools are grounded in behavioral responses of team members and linked to the learning objectives that provide the basis for valid, reliable, and diagnostic measurement of complex team performance.

EBAT methods have been applied to training teamwork in military and aviation domains, but to date have not been applied to healthcare teamwork training. However, EBAT has been applied to individual level training in EM. The Simulation Module for Assessment of Resident Targeted Event Responses (SMARTER) approach is an application of the EBAT method to the training and assessment of the ACGME core competencies in EM residents.[5,6] The SMARTER approach offers benefits in two key areas of EM graduate education: 1) the design of structured simulations directly linked to the ACGME core competencies and 2) the capability to directly link measurement of learning outcomes to the simulation events. The criticality of these SMARTER contributions is especially salient in light of the need to learn outcomes data based on the ACGME core competencies. SMARTER provides a method for designing both the necessary learning experiences and the performance measurement tools for EM resident training and evaluation.

AN EVENT-BASED APPROACH TO SIMULATION-BASED TEAMWORK TRAINING FOR EM RESIDENTS

The process presented below is an adaptation of the general EBAT methodology to the specific needs of training teamwork skills for EM residents. This method systematically links the content of training scenarios and measurement tools to the teamwork competencies being trained. The products of this process are structured learning experiences and measurement tools for maximizing learning. Properly structured scenarios ensure that residents have the opportunities to perform targeted teamwork behaviors, and accompanying measurement tools ensure that the residents' performance can be captured and diagnosed, the results of which feed the provision of feedback and decisions about remediation. We discuss an example scenario of training leadership skills during an ED resuscitation as we present the methodology. Table 1 summarizes linkages between teamwork competencies, learning objectives, KSAs, trigger events, and targeted responses for this example. Table 2 provides an example observational checklist derived from these linkages. The overall process is depicted in Figure 1.

A fundamental step in systematically designing training of any form involves specifying what is to be trained—the competencies. Team training in healthcare has been criticized for a lack of a competency-based approach in the past.[24] However, the TeamSTEPPS program has provided a scientifically rooted and evidence-based set of teamwork competencies that are generalizable across health care specialties.[25] These competencies are leadership, situation monitoring, mutual support, and communication and are used as examples for this process. As the understanding of teamwork in EM progresses, this generalizable set of competencies can be replaced with a set of teamwork competencies specific to the EP's role.

1. Focus on a Subset of Teamwork Competencies

Teamwork is complex, dynamic, and rooted in many different KSAs.[26] It is too complex to train or assess the complete set of teamwork competencies in any one scenario; therefore, it is necessary to narrow the scope of competencies trained in any one given scenario. By selecting a focal set of teamwork competencies at the beginning of the process, the scenario content and measurement tools can be shaped to maximize learning on these points. This approach is based in the recognition that observers are only capable of reliably rating a limited set of dimensions[1] and that feedback during debriefs is most effective if it focuses on a limited set of key performance issues.[27,28] Because the focus of any one scenario is limited, for training and assessments to effectively train all aspects of teamwork, a set of scenarios should be developed that systematically sample the full range of teamwork competencies. Having multiple scenarios will provide a complete picture by addressing the full spectrum of all of the teamwork competencies. In the example provided, leadership is the focal competency.

2. Define Specific Learning Objectives, Rooted in Teamwork Competencies

The second step in the process is to define explicit and measurable learning objectives for the focal set of competencies. Competencies are general specifications and as such are not at a level of granularity that affords measurement and guidance for developing scenario content. Learning objectives are specifications of the teamwork competencies that will be trained in a given scenario.[1] These must be measurable because feedback will be generated relative to these learning objectives. For example, in a resuscitation scenario, some of the learning objectives for teamwork might include anticipating and predicting the needs of other team members or exchanging information in a clear and precise manner (see Table 1 for a full list of learning objectives for the example scenario).

3. Choose a Clinical Context to Frame the Scenario Development

Once the teamwork competencies have been refined and the learning objectives have been defined, a clinical

context must be chosen to frame the scenario development. There are numerous possible clinical contexts that can be employed to evaluate teamwork competencies; however, it is critical that a clinical context is selected based on its ability to train and assess the desired objectives. Ultimately the scenario must provide opportunities for residents to practice teamwork behaviors, and in this light, all clinical contexts are not created equal. Successful performance in some clinical contexts may be driven primarily by individual competencies (e.g., medical knowledge) and therefore would not be appropriate for teamwork training. For instance, the clinical context could involve interdependent performance, where one team member is unable to fulfill his or her usual role, forcing another team member to fill in, which exemplifies mutual support. Ideally, teamwork competencies should be trained and assessed over a broad range of clinical contexts or disease processes.

4. Develop a Set of Targeted KSAs to Capture the Predefined Objectives and Competencies

The fourth step, developing a set of targeted KSAs, is one of the most critical components of the process. For a resident to display effective teamwork, he or she must ''think,'' ''do,'' and ''feel'' certain things.[23] The KSAs are these underlying thoughts, actions, and attitudes that a team member must possess to perform successfully and meet the stated learning objective. For example, for teams to be able to demonstrate mastery/expertise in teamwork skills, some of the KSAs might include identifying the team leader, observing and directing activities of other team members, and reallocating resources appropriately when necessary. The purpose is to determine if the resident has acquired the necessary KSAs to perform successfully. Defining the KSAs is a critical step in establishing linkages between the learning objectives, clinical scenarios, and measurement tools and serves as the foundation for developing scenarios and performance measures. Additionally, without a clear specification of the KSAs, performance diagnosis is not possible; that is, it is not possible to determine what caused effective or ineffective performance. The performance diagnosis process drives decisions about what feedback to provide and the selection of future training.[29]

5. Craft the Scenario to Ensure Team Members Have the Opportunity to Display Targeted KSAs—Define the Critical Events

After the KSAs have been established, it is time to craft the scenarios. The scenario serves as the curriculum in SBT. The events in the scenario are essentially the content of the training. It is not enough to simply practice skills. This alone is not enough to ensure positive learning; practice must be guided. Specifically, the scenarios must be designed to elicit responses that will indicate whether or not the resident possesses the targeted KSAs. Therefore, trigger events are embedded throughout the simulation to ensure there are appropriate opportunities to perform. Trigger or critical events are defined as changes in the cues or patterns of cues available to the resident (e.g., simulated patient physiology, communication, or performance patterns of confederates) that serve as prompts to elicit a specific set of behaviors linked to the KSAs targeted for training. The changes are controllable by the scenario designers and engineered to tap the KSAs targeted for training. To illustrate, an ED tech might perform shallow chest compressions at 40 per minute. This particular event should prompt the resident to instruct the ED tech on how to perform chest compressions correctly. If the resident does not respond as described, it is an indicator that he or she is deficient in KSAs related to the teamwork competencies of mutual support or situation monitoring.

6. Define a Set of Targeted Responses

The trigger events embedded in the scenario must be connected to objective, observable behaviors (i.e., targeted responses). As discussed above, the presence or absence of targeted responses indicates whether or not the resident possesses the targeted KSAs. Furthermore, the targeted behaviors generate constructive feedback, which is essential for maximizing learning. As an example, a scenario event may be a confederate ED nurse stating, ''Do you want me to put the patient on a monitor, put in an IV, or bag the patient? There's only one of me!'' The defined responses may include asking the nurse to place the patient on a monitor first and then secure an IV, meanwhile taking responsibility for bagging the patient. The presence or absence of these behaviors is indicative of the teamwork KSAs related to leadership and mutual support in the resident.

7. Create Diagnostic Measurement Tools

The preceding steps feed directly into the process of generating diagnostic measurement tools. Most readily, the critical events and targeted responses can be used to create a behavioral checklist. Events are ordered in time and targeted responses are clustered around the associated event. Because targeted responses are behaviorally defined, observers can score dichotomously (i.e., the resident either did or did not exhibit the targeted behavior). These event-driven checklists are advantageous for two reasons. First, events defined a priori enable observers to focus their attention at critical moments during a scenario. This reduces observer workload and increases the reliability of ratings. Second, raters are only asked to score the presence or absence of specific behaviors and not make judgments about the quality of behavior. This also increases the reliability of ratings. The scores from the checklists can then be used to determine the level of proficiency as well as generate feedback based upon the events and responses. Because multiple opportunities to perform are intertwined throughout the scenario, it is possible to see variations in performance over time. Table 2 illustrates an example observational protocol rooted in the events and responses outlined in Table 1. Behavioral checklists are one of several measurement techniques (e.g., behaviorally anchored rating scales, self-report surveys) that can be incorporated into SBT for teamwork. Because any one approach has associated tradeoffs, an overall strategy that incorporates multiple measurement approaches is highly recommended. More detailed discussions of these issues are available elsewhere.[6,30]

8. Create Scenario Script

The final step in the process involves creating the scenario script. The script is a plan for how events will unfold throughout the scenario. It coordinates the events in the scenario rooted in such things as patient simulators as well as any confederates participating in the scenario. All of the key players know their roles and responsibilities. They know what to do and when to do it. The scenario script maintains standardization and consistency, both of which are essential for making performance comparisons and ensuring a structured learning experience.

DISCUSSION

As outlined in Figure 1, the process presented in this article identifies key steps in the design of guided practice activities and the development of accompanying measurement tools. The process begins with identifying the general teamwork competencies that must be trained and proceeds with a more concrete specification of learning objectives for a given scenario. Because performance in health care is notoriously task or procedure-dependent,[31] the choice of a clinical context is an important decision when designing practice activities. Given the learning objectives and a specific clinical context, the KSAs that underlie effective performance are generated. These KSAs guide development of the structure of practice activities (i.e., the critical events) as well as the content of the measurement tools (i.e., the targeted responses) and ultimately the scenario script. By maintaining these linkages, performance during the simulation can be diagnosed; that is, the degree to which a resident possesses KSAs targeted for training can be determined. This information drives decisions about feedback and remediation.

Despite the fact that teamwork training and SBT are relatively new considerations for EM and health care in general, there have been major strides in developing and evaluating strategies of application and evaluation.[18,32–35] However, there is presently a need for standardized methodologies and tools for curriculum designers that enable them to maximize the potential of SBT for training a variety of skills, including teamwork. The method presented here is one approach to doing so. It is an adaptation of general approach—EBAT—that is widely applicable to designing practice activities for training many types of dynamic performance important to quality and safety in EM.

CONCLUSIONS

The process outlined above is based in the science of learning and training.[36] It provides a systematic means for generating structured learning experiences and diagnostic measurement tools capable of driving the feedback and remediation processes necessary for learning. Throughout the process, linkages are maintained between the content of the scenario, learning objectives, and measurement tools. Training teamwork has successfully been demonstrated in non–health care industries and may be fruitful for EM residency programs. The process outlined here draws on proven methodologies and strategies for maximizing time spent training teamwork skills. We hope that more systematic, rigorous, and scientifically rooted methods for training teamwork skills for EM physicians are adopted. Incidents of patient harm due to failures in teamwork can be greatly reduced with systematic training.

This work was supported by the Department of Defense under contract W81XWH-05-1-0372 to the second author. All opinions expressed in this paper are those of the authors and do not necessarily reflect the official opinion or position of the University of Central Florida, the Orlando Regional Medical Center, or the Department of Defense.

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