Applying Crew Resource Management (CRM) Principles to First Responder Training

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ABSTRACT

Effective team coordination and decision-making skills are essential for emergency medical personnel. First responders are particularly vulnerable because of the urgency of their decisions, subsequent actions and frequent unknowns. Currently, training for medical personnel focuses on procedural knowledge and skills. Effective training in team coordination and decision-making for EMT personnel responding to CBR/WMD is not available.

The aviation industry has been providing similar team coordination and decision-making training to aircrews for well over thirty years. Our approach includes capitalizing on that experience and applying some of the same principles and techniques to development of a tutor that trains emergency medical responders for CBR/WMD threats.

One of our goals is to foster a better learning environment for CBR/WMD incidents by enabling learners to participate actively in the team coordination and decision making processes, to think reflectively about what they are doing and the decisions they have made, and even to work collaboratively with other EMT learners through the problems presented by the tutor. In addition to the life-and-death decisions regarding their patients, EMTs may be faced with other more far-reaching decisions that involve the contamination of themselves and others with highly toxic substances. The design of the tutor is based on established CRM principles. When used in an active learning environment it should assist EMTs in learning what goes into making sound decisions under stress and how to coordinate the activities of their team rather than functioning independently.

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INTRODUCTION

This paper describes the approach taken on two separate Small Business Innovative Research programs[1] to provide sustainment training[2] to first responders. The authors will describe how they selected specific tasks for simulation and applied principles used for aircrew training to emergency medical technician training. The purpose of the tutor being developed is to provide first responders with practice in team coordination and decision making in critical medical emergency situations.[3]

THE PROBLEM

Within the military, an increasing number of joint operations demand that effective team coordination and decision-making skills are essential for emergency medical personnel, especially when multi-national forces are involved. First Responders to Chemical, biologic and radiologic (CBR) and Weapons of Mass Destruction (WMD) threats are particularly vulnerable because of the urgency of their decisions, subsequent actions and frequent unknowns surrounding them. Procedural knowledge training related to CBR/WMD equipment and techniques is adequate and plentiful. However, effective training in team coordination and decision-making for CBR/WMD first responders is not available.

The lack of effective training to develop decision-making and team coordination skills in response to CBR/WMD threats extends to all the military services and most civilian EMS organizations (Kelly et al., 2002). This training deficiency may impede an effective response to CBR/WMD threat environments by ground-based or air evacuation medical teams. Emergency medical professionals need a means of accelerating their acquisition of expertise in decision-making and team coordination. These critical skills underlie our ability to respond to chemical, biological and radiological, and other similar horrific threats.

Currently, almost all training for deployable medical personnel occurs as on-the-job training in the field and focuses on the acquisition or upkeep of procedural knowledge and skills. Little-to-no sustainment training is available for the kinds of high level decision-making associated with assessment and response to CBR/WMD threats. Training in team coordination skills and knowledge is routinely left for courses at advanced NCO academies. This severely limits the capability of both military and civilian EMS organizations to rapidly produce and maintain *mission ready* personnel for deployment. There is a need for training that provides a rehearsal capability for these critical skills. This training and rehearsal capability must be usable by emergency medical personnel both at their home duty station, on transport aircraft en-route

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[1] Deployable Simulation Training for Operational Medical Personnel & Emergency Responders (Phase I) OSD03-DH04 managed by the Telemedicine and Advanced Technology Research Center (TATRC), an agency of U.S. Army Medical Research and Material Command, and Global Treatment Protocol Course (GTPC) via Advanced Distributive Learning (Phase II) OSD02-DH09 managed by the Air Force Research Laboratory, Human Effectiveness Directorate, Warfighter Training Research Division.

[2] Army FM 25-5 defines *Sustainment Training* as: "The provision of instruction for practice to ensure that individual or collective task proficiency is maintained at a required level. The frequency will vary with individual and collective tasks; the role, location, and personnel to fill the unit; and the desires of the commander." The Air Force discusses similar training in AFI36-2201V1 as: "Proficiency Training—Additional training, either in-residence or exportable advanced training courses, or on-the-job training, provided to personnel to increase their skills and knowledge beyond the minimum required for upgrade."

[3] The views expressed are those of the authors and do not reflect the official position of the U.S. Army Medical Research and Material Command or the Air Force Research Laboratory.

to deployment, or within theater. As FM 25-5 puts it: "Through sustainment training programs, unit training must embed those skills learned into effective collective task performance."

CREW RESOURCE MANAGEMENT (CRM)

The aviation industry has been providing similar team coordination and decision-making training to aircrews for well over thirty years. Training for first responders is typically focused on the technical aspects of the job – little, if any, is devoted to human factors, or other issues that could present risks to the team or casualties. The level of decision-making and team coordination associated with CBR/WMD threats calls for a simulation-based training program that could help advance key human systems integration factors for first responders. Our approach includes capitalizing on current and past CRM experience and applying some of the same principles and techniques to training emergency medical responders for CBR/WMD threats. We resolved to apply Crew Resource Management (CRM) principles to first responder training. Our goal was to develop a tutor that teaches EMTs how to:

- understand and employ situational group dynamics
- recognize the effects of stress and cope with it
- plan for and perform self-critique of CBR/WMD operations
- assess, mitigate, and manage risk
- consider a full range of options thereby making better informed decisions
- manage the team's workload
- better communicate mission-essential information
- for the entire team to maintain situational awareness.

CRM Background

"*The effective use of all available resources--people, weapon systems, facilities, and equipment, and environment -- by individuals or crews to safely and efficiently accomplish an assigned mission or task.*" AFI 11-290

Since the 1970ies researchers have determined that an overwhelming majority of aviation accidents are the result of human error rather than attributable to equipment or environmental causes (APA, 2004; Ruffell-Smith, 1979; Diehl, 1991, Taggart, 1994). So, in the ensuing decades, military and commercial aviation have turned to programs aimed at decreasing errors and making aircrews safer and more productive (see AFI 11-290 and FAA AC 120-51D). CRM training programs focus on the "*human*" elements associated with flight deck tasks. The earlier programs evolved into what is currently called Crew/Cockpit Resource Management (CRM) training.

CRM Principles

These days CRM focuses on six principles that have become the cornerstone for training and evaluating aircrew behavior and mission accomplishment (AFI 11-290, FAA AC 120-51D). Briefly, the principles are:

- **Situational Awareness**. Maintaining awareness of the operational environment and anticipating contingencies.
- **Leadership and Assertiveness**. Coordinating activities and maintaining proper balance between respecting authority and practicing assertiveness. Advocating the course of action that is best, even though it may involve conflict with others.
- **Communication**. The importance of clear and unambiguous communication, communication barriers such as rank, age, gender, and organizational culture, conflict resolution techniques, and the use of appropriate assertiveness and advocacy.
- **Decision Making**. Effective techniques for seeking and evaluating information.
- **Task Management**. Establishing priorities, avoiding complacency, management of available resources, discipline, planning and time management, prioritizing tasks, and avoiding distractions.
- **Mission Analysis**. Reinforcing effective human factors practices by carefully debriefing team activities, concentrating on the processes that were followed, and recognizing effective and ineffective team behavior.

Why Apply CRM to EMTs?

CRM programs typically consist of educating crewmembers about the limitations of human performance while healthcare professional training and education have traditionally focused on developing technical proficiency rather than facilitating human interaction (Pizzi et al., 2001). Many CRM training programs require learners to participate in exercises in which they must assess their own and peer behavior regarding flying attitudes and other interpersonal relationships. Learners develop an understanding of how cognitive errors effect flying operations. They are taught how stress in the form of fatigue, pressure from emergency situations, and work overload can contribute to increased errors. Other concepts included in CRM training programs consist of a *challenge and response* approach, how to seek relevant operational

information, advocacy, communicating proposed actions, conflict resolution and decision making. All of these CRM topics relate in one way or another to EMT personnel and the actions they will have to take during CBR/WMD events.

Similar CRM-like programs have been developed for other disciplines such as offshore control room operators for the oil industry (Flin, 1997). For the control room operators, CRM is not the focal point of the program; rather, human factors modules were designed by psychologists and integrated into the course. Course content covers major CRM topics such as decision making, communication, assertiveness, and stress. Methods include lectures, exercises and discussion of personal experiences related to the topic areas in accordance with the current CRM model.

The similarities between CRM principles applied to aircrews and those that would be applied to emergency medical personnel are striking (see Table 1). Several studies examined the environment in which medical personnel work and concluded that CRM principles could be successfully applied to operating room and intensive care surgeons and nurses (Sexton, et. al., 2000), anesthesiologists (Howard, et. al., 1992), pediatrics (Halamek, et. al., 2000), and emergency room teams (Risser, et. al., 1999). Armed with this data we reached the conclusion that it is time to apply CRM principles in training EMT personnel, especially when teaching them to deal with the decision making and team coordination issues involved with CBR/WMD incidents. In fact, we would advocate that CRM principles be translated into observable, measurable and standardized elements to be integrated into existing first responder training programs.

Typical EMT *Modus Operandi*

While the application of CRM to healthcare professions is relatively rare, we envision several possibilities for applying CRM to EMT training in support of decision making and team coordination learning goals. As we mentioned before, a majority of EMT training programs concentrate on providing the procedural knowledge and skills necessary to perform as an emergency medical technician. In fact most medical training programs follow this same model (Pizzi et al., 2001).

Table 1. Similarities between Aircrew and EMT CRM.

CRM Principle	Aircrew	Medical
Situational Awareness	• awareness of the operational environment • anticipate contingencies	• awareness of scene safety and patient(s) condition • anticipate developing threats to personnel and patient(s)
Leadership and Assertiveness	• assertiveness and advocacy • conflict resolution techniques	• assign tasks based on medical skill level • conflict resolution techniques
Communication	• clear and unambiguous communication – aviation jargon	• clear and unambiguous communication – medical jargon
Decision Making	• seeking and evaluating own plane and mission information	• seeking and evaluating event and patient information
Task Management	• establishing priorities, avoiding complacency • management of available resources and time • avoiding distractions	• establish priorities for safety, patient care, and evacuation • manage personnel, equipment and available medical supplies and resources • avoid distractions
Mission Analysis	• debriefing activities, recognizing effective and ineffective team behavior	• recognize system inadequacies, effective and ineffective assessment, treatment and transport decisions

While free-flowing communication, medical team organization and coordination, and rapid and accurate decision making are essential to good medical practice, none of these are a primary component in EMT training programs. The focus of training for EMTs as for other medical professionals and technicians is on technical proficiency in medical tasks not soft skills. In addition, for the most part, EMTs are trained to function independently rather than as part of the coordinated effort of a team.

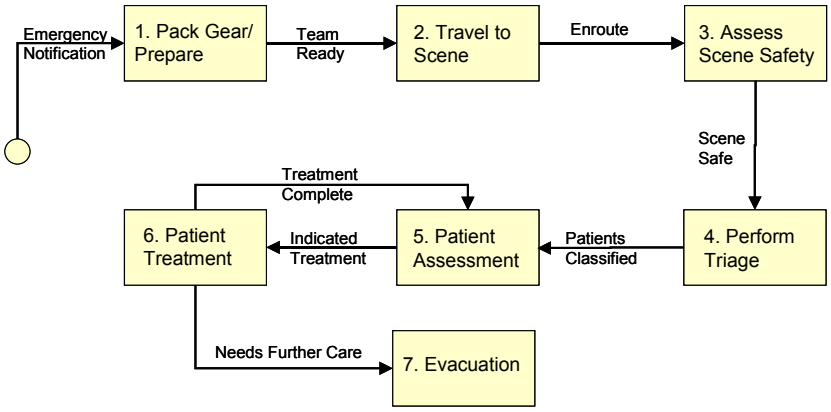

Figure 1. EMT *Modus Operandi*.

A cultural shift in the current approach to medical training may be necessary for CRM to be included as part of the program as the *norm*. To help combat anticipated resistance, our methodology consists of integrating CRM principles into the traditional EMT approach to doing business (see Figure 1).

Any aircrew member would recognize a typical aviation *modus operandi* consisting of mission planning, takeoff, climb to altitude, en route (to mission), ingress, specific mission tasks (like reconnaissance, attack, fighter, tanker, transport), egress, en route (to base), descent, landing, and mission debrief. In the same way, most, if not all EMTs would recognize the typical EMT approach to an emergency depicted in Figure 1. The parallels between these two approaches to accomplishing a mission are obvious even to the casual observer. Given this EMT *modus operandi*, we made the decision to develop a tutor that emphasized team coordination and decision making as it applies within each of these major activities.

APPROACH

Our approach included a cognitive task analysis of several specific situations in which an EMT might find himself (Militello & Snead, 2004). Interviews were conducted with experienced medical personnel with the goal of determining what an expert would do in a CBR/WMD environment, and what someone should learn about operating with casualties in such an environment. The experts described their personal experiences treating or caring for patients involved in CBR/WMD situations in deployed environments. They also offered their opinions regarding training of personnel in CBR/WMD procedures.

Each of the four case studies elaborated by Snead provides an interpretation of a CBR/WMD-related issue, along with critical decisions encountered. We used the case studies and especially the critical decision points as a baseline for developing initial training scenarios for first responders. Using the individual cases as a starting point we developed a methodology (see Figure 2) for elaborating the training scenarios. The methodology was aimed at enabling us to change elements of a case thereby increasing or decreasing the

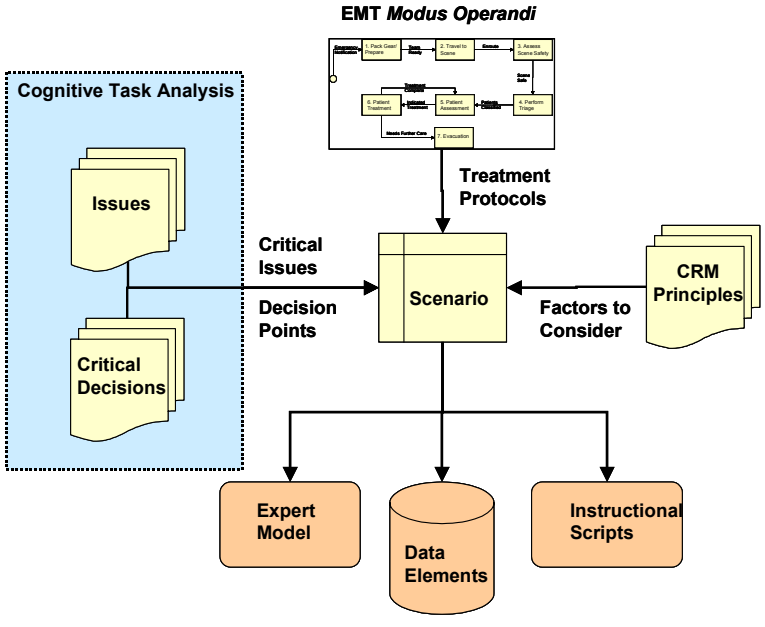

Figure 2. Methodology.

difficulty of scenarios. The methodology also enabled us to tailor scenarios to reflect specific types of deployment such as in combat under fire or in a peacetime environment such as at an embassy.

Applying CRM to EMT Modus Operandi

As mentioned, our methodology included using the critical issues and decision points revealed by the cognitive task analysis to begin formulating training scenarios for the tutor. All scenarios faithfully followed the typical EMT *modus operandi* (depicted in Figure 1), namely, they began with an initiating cue, involved preparing the team and equipment, often allowed time to plan activities and make work assignments (usually en route to the scene of the incident), involved an assortment of casualties and injuries, and required decisions to be made about evacuation and other treatment related events. For each CRM principle we developed a list of questions that probed whether the factor had been applied to the step being considered. Figure 3 demonstrates the questions we used for "Step 1. Prepare/Pack Gear."

Scenarios

Given this approach, scenarios were developed so that they could be easily modified or manipulated by changing one or several of the elements (variables) to make them more or less difficult, applicable to individuals or teams, or focus on a specific skill such as communication, etc. The exercise in constructing scenarios provided us with information needed to build several components of the tutor (see Figure 2).

Step1. Prepare/Pack Gear

Selected CRM Factors to consider:

Communications

Did the team leader let the team know what the operation was about and what the plan was?

Did team members acknowledge their understanding of the operation and plan? Did the team leader ensure that there was a common understanding of the operation and plan?

Did the team members express their own ideas, opinions, or recommendations about the plan? Were they acknowledged?

Were safety and operational issues discussed?

Was the division of labor and team workload discussed?

Decision making

Did the team leader engage team members in any decision making? Were questions routinely asked about the plan?

Leadership/followership

Did the team select the right type and quantity of resources to accomplish the job at hand?

Did the team leader/members recognize the effect of stress and fatigue on performance?

Did the team practice effective time management?

Interpersonal relationships

Were the team members calm under stressful conditions?

Situation awareness

Did the team leader/members anticipate contingencies and plan for them?

Workload distribution

Did the team leader prioritize tasks for the team? Was the team aware of these priorities?

Did the team leader distribute tasks to team members to maximize efficiency?

Was the workload distribution clearly communicated and acknowledged by team members?

Figure 3. CRM Factors to Consider in EMT Modus Operandi.

Expert Model

The scenarios provided us with the specific path that an expert would "*trace*" through the tutor when presented with a problem. Of concern to us were those decision points that had been elicited during the cognitive task analysis and whether any deviation in scenario conditions would affect an expert's decisions.

Data Elements

We built a database of specific domain knowledge, and variables such as contents of the medical kit, the communications capabilities available at any one time, and other similar factors which could enhance or hamper the learner's ability to perform the required tasks.

Instructional Scripts

One outcome of scenario development is the specification of instructional goals and associated rules. We used several instructional strategies to plan the interactions between the learner and the tutor. Instructional scripts developed with the EMT *modus operandi* in mind, guided the learner's potential interactions with the tutor.

TUTORING APPROACH[4]

The tutor has four major functional elements. First, it presents a CBR/WMD scenario or situation to the learner upon which he must act. Next, the learner initiates interaction with the tutor to solve the problem at hand in the emergency medical incident. Once the learner has solved the problem (or failed to solve it, in which case the tutor terminates the problem "for cause" or time), the tutor provides an evaluation of the learner's actions. Finally, the learner has the option of replaying all or part of the incident scenario.

Scenario Elaboration

Typically, a tutor practice session begins with the introduction of a scenario or incident. The scenario is described in some detail. While many of the facts presented in the explanation are necessary for the learner to solve the CBR/WMD problem, not all are provided. Frequently, some of the required data must be searched for by the learner using the various tools available to him, e.g., telephone, radio, documents, asking a bystander, etc. Sometimes the details provided in the introduction are quite unnecessary for the learner to accomplish the goal of the lesson. These extraneous bits of information serve as distractors rather than useful elements to solve the problem. The amount of time it takes to solve the problem is frequently a critical component of the scenario. If the learner spends too much time exploring "distractors" he will not be able to accomplish the required tasks in the time allotted. The result may be the worsening of a casualty's condition or death.

[4] The tutor is still in development at the time this paper was authored. This section describes conceptually how the tutor will operate.

The learner has various tools available that are normally found at a medic's disposal. As is common for EMTs, selecting the right "kit" is often part of the problem. Take too little, and the learner is unable to perform adequately; take too much, and fatigue becomes a factor when carrying all the items. Various communications are available depending on the environment and degree of difficulty of the scenario. Communications can be a blessing when the desired information is readily obtainable or a bane when miscellaneous radio calls interrupt critical activities.

Since the tutor's purpose is to provide practice in team coordination and decision making, there are frequently, other participants involved in a scenario. Other participants may range from other EMT team members with varying degrees of expertise who accompany the learner, or bystanders with little or no medical experience or training. It is up to the learner to decide how to employ the other participants and to coordinate their activities.

Problem Solving

When the learner is ready to practice, he activates the scenario. Some scenarios may require the learner to travel to the scene. During this time the learner must apply various CRM principles correctly to solve team coordination problems. At other times the learner may find himself already at the scene of the incident. Then team coordination (if required by the scenario) will require immediate attention.

Other players involved in the scenario are computer generated, e.g., casualties, other medical personnel, bystanders, etc. Sometimes the learner must direct other team members and bystanders. These players can exhibit attitudes that are cooperative or uncooperative depending on the degree of difficulty to be interjected into the scenario. Fatigue, stress, and other traits characteristic of people will play a part in how each of these other players reacts to the learner's coordinating actions.

The tutor is not so much concerned with the performance of specific medical tasks such as "How to Start an IV" as it is with what the learner does to save the injured in the specific scenario situation and works with the team to make the right decisions. The learner must focus on: What to do? When to do it? Who does what? Who to evacuate? When to evacuate? How to evacuate? In other words, the learner must take charge, make the right decisions, and lead the team through the problem at hand in the scenario.

As you can see, learners are presented with a critical situation, provided a team to respond, and allowed to make decisions (right or wrong) about what to do. At

the end of a scenario, learners receive feedback on their performance based on how closely they approximate the expert model "trace." This "*no-fault*" approach allows learners to practice making decisions and see what happens if they make right or wrong ones. Learners must correctly apply CRM principles to solve the team coordination problems that occur simultaneously with the medical problems.

The task terminates when the learner completes it, or the tutor may intervene if the casualties' lives are put in jeopardy. The tutor traces the actions of the learner and at the end of the scenario, compares the learner's actions with those of an expert.

Feedback/Debrief

A feature of the tutor is that the learner is allowed to "practice" as much as he desires without the tutor interjecting itself to provide criticism of his actions. This "no fault" practice enables the learner to try out his decision making and team coordination skills without fear of being interrupted by criticism. Instead, the learner gets feedback on performance after completing the scenario. At this point, the learner's actions during the scenario are compared to those of an expert. Each step or action taken by the learner is compared with what the expert would do. Wherever the learner departs from the path set by the expert, he has the option of seeing an explanation of what was "wrong" about the action. Finally, the learner is given an overall evaluation that indicates whether his actions were effective in saving the injured or not.

As you might imagine, we agree with those who would say that continuous detailed feedback may actually be counterproductive to learning (Bass, 1998, Wilson & Cole, 1991). By limiting feedback until the learner completes a scenario, we may be able to enhance the self-reflective processes that learners apply to problems. We have designed the tutor so that instructional interventions do not interfere with such learning activities. Rather, the learner is allowed to explore the learning space unimpeded, performing as he would normally respond in a situation. After the event has run its course, and only then, does the tutor provide the learner with an opportunity to second guess himself and get detailed instruction as to why the action(s) taken were "wrong."

As with most learning environments, the tutor also provides the learner with an overall evaluation. This evaluation is an approximation of how close the learner's *trace* came to the expert's *trace* through the same problem. If the traces are identical, the overall evaluation is 100%. As the traces diverge from one another, the overall score is reduced.

Replay/"*What-If* Capability"

One feature of the tutor allows the learner to go back into a scenario again to try out a different set of actions. This "*what if*" capability gives a learner more confidence in making decisions and lets him hone his team coordination skills through additional practice. Furthermore, by allowing the learner to "do the task over" the learner gets to see the consequences of actions taken, and what might have happened if a different path had been selected. So, even if the learner got everything "right" in the scenario the first time, he could go back through the scenario to see what might have happened if he did things differently.

DESIGN ISSUES

"Each WMD incident will be unique, and is unlikely to resemble any specific event used in an exercise ... it is necessary to provide experience in a large number of areas so that participants can confidently adapt their skills to whatever events they may confront." (Kelly et al., 2002)

One of our goals in designing a tutor that provides learners with a tool for practicing team coordination and decision making skills is that it fosters a better learning environment than if we had simply told them what to do in certain situations when faced with CBR/WMD incidents. While that approach could be one element of the learning experience, our intention is to enable learners to participate actively in the team coordination and decision making processes, to think reflectively about what they are doing and the decisions they have made, and even to work collaboratively with other EMT learners through the problems presented by the tutor.

Research (Kolb, 1984, Gagne, 1985, Chickering & Gamson, 1987, Bonwell & Eison, 1991, Holzer, 1994), suggests that learners must be active participants in order to learn effectively. Learners must be engaged in solving problems, discuss what they have learned, write about it or somehow reflect on the learning experience. In other words, learners should be actively involved in the learning process by engaging in higher-order tasks like analyzing what has happened, synthesizing various elements to form new ideas, practicing what they have learned, and evaluating their activities. Therefore, we designed the tutor to give learners opportunities to think about what they should do, to take the action, and to evaluate the effects their action had on the outcome.

We feel that active practice sessions for EMT personnel making decisions regarding simulated CBR/WMD casualties, and coordinating a simulated team of first responders in reacting to such incidents is the best environment for them to learn how to do these tasks.

These learners are not novices. They already have one or several schools *under their belt*. These are practicing EMTs who need sustainment training that augments and enhances their current skills. As such, our approach empowers them to work their way through CBR/WMD incidents by making the right decisions and leading and coordinating their team.

Lesson Topics

Since our goal is to address the lack of effective training to develop decision-making and team coordination skills in response to CBR/WMD threats, we selected several major topic areas to be the focus of the tutor scenarios (lessons). These topics are pertinent for preparation of individuals and teams to respond to CBR/WMD threats:[5]

- Chemical agent exposure
- Biologic agent exposure
- Radiologic agent exposure
- Traumatic injuries (blast, penetrating, blunt chest, blunt abdomen, closed and open brain injuries)
- Mass casualty incident response (START triage, JumpSTART triage)
- Psychological emergencies

THE BIG PICTURE

The tutor we have just described is not meant to stand alone. It is intended to be part of a larger sustainment training package for first responders accessible via the Internet. As the team coordination and decision making practice component of the sustainment training package for first responders, the tutor will be included along with reference materials, pharmacological notices and advisories, and other training materials. All of these complementary resources are encompassed under a single web portal called the JXT Medical Training Portal, which will support current and future training needs of military and civilian first responders.

All learning materials included in the portal incorporate currently accepted distance learning design practices, including ADL/SCORM compatibility. The portal uses a community of practice approach providing a single point for accessing emergency medical learning materials such as the tutor; an on-line library of references, links to other support materials, medical organizations and related sites; and, a collaborative environment of chat rooms; bulletin boards, and instant messaging.

CONCLUSIONS

In addition to the life-and-death decisions regarding their patients, EMTs may be faced with other more far-reaching decisions that involve the contamination of themselves and others with highly toxic substances. The design of this tutor which is based on established CRM principles and presented in an active learning environment should assist EMTs in learning what goes into making sound decisions under stress, and how to coordinate the activities of their team rather than functioning independently.

We should all thank God that we did not find weapons of mass destruction in Iraq. However, sooner-or-later first responders involved in military actions abroad or here at home will encounter such weapons of immense destructiveness. They will be the first ones on the scene, and they better know instinctively what to do, or there will be tragic results. Practice making the right decisions and being able to see the effects of the wrong decisions in a simulated environment should give them the confidence and skills necessary to deal with such potential horrific incidents in real life.

As a goal for the future we can see another element that could be added to the tutor as a complementary sustainment training capability. As a lead in to the tutor practice environment we envision learners reviewing realistic case studies in which they critique the behavior of others who are performing in situations similar to those in which the EMT will find himself. These critiques follow the same model that is used in CRM training for aircrews. View a situation in which a team is involved in an incident. Discuss in a group environment the positive and negative aspects of the team behavior (we see this collaborative discussion taking place over the Internet through the MERC portal). Finally, discussing their own feelings and reactions to the behaviors with other participants. This emotional training element would provide an excellent accompaniment to the simulated practice environment provided by the tutor.

ACKNOWLEDGEMENTS

The authors wish to thank the sponsors of this research Dr. Gerald R. Moses, Chief, Clinical Applications Division, J. Harvey Magee, Project Officer, Medical Modeling & Simulation & Advanced Medical Technologies, Telemedicine and Advanced Technology Research Center, U.S. Army Medical Research and

[5] These topics were the result of our work on the U.S. Army Telemedicine and Advanced Technology Research Center program: Deployable Simulation Training for Operational Medical Personnel & Emergency Responders, and are confirmed by the American College of Emergency Physicians in Waeckerle et al., 2001.

Material Command; and Dr. Barbara Sorensen, Air Force Research Laboratory, Human Effectiveness Directorate, Warfighter Training Research Division.

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