

## A TRANSITION FROM AVIATION CREW RESOURCE MANAGEMENT TO HOSPITAL EMERGENCY DEPARTMENTS: THE MEDTEAMS STORY

John C. Morey, PhD  
Crew Performance Group  
Dynamics Research Corporation  
Andover, Massachusetts 01810

Gregory D. Jay, MD, PhD  
Associate Professor of Medicine and Engineering  
Brown University  
Providence, RI 02192

Robert Simon, EdD<sup>1</sup>  
Center for Medical Simulation  
Cambridge, Massachusetts 02139

Matthew M. Rice, MD, JD  
Northwest Emergency Physicians  
Seattle, WA 98188

Although health care is commonly delivered by teams, the health care industry is skeptical about the effectiveness of teamwork. This skepticism may account for the absence of team process training interventions in health service organizations. The MedTeams project, an adaptation of crew resource management (CRM) for hospital emergency departments, is a response to the need for behaviorally-based teamwork training. The background, curriculum, and operational evaluation of the MedTeams project are presented. Features of the aviation and health care environment that influenced MedTeams are contrasted, and future directions of the project are described.

The development of crew resource management (CRM) principles and training approaches in aviation has gone through identifiable stages. What started as an interpersonal training intervention now focuses on behaviorally-oriented, risk management skill training (Helmreich, Merritt, & Wilhelm, 1999; Leedom & Simon, 1995). These developments in the aviation industry have been adopted in other industries such as nuclear power, oil drilling, and more recently, health care. This paper describes the concepts, programmatic development, and research findings from the MedTeams project, our adaptation of aviation CRM to emergency department (ED) staff in civilian hospitals and military facilities.

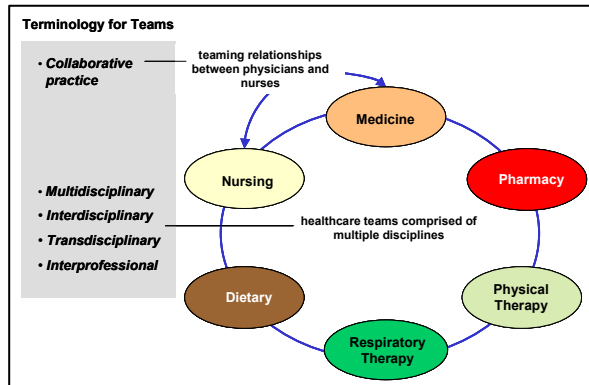
Despite similarities in the operational dynamics of EDs, ORs, and ICUs to those of aviation, healthcare has not rapidly embraced CRM as a central mechanism for enhancing teamwork. Adopting CRM may be hastened by the patient safety movement and specific recommendations (cf., Recommendation 8.1) by the Institute of Medicine of the National Academy of Sciences (Kohn, Corrigan, & Donaldson, 1999). However, the teamwork process features that characterize CRM interventions have been overshadowed by other aspects of teams and teamwork that have been explored in theory and practice in healthcare. In order to establish how CRM fits into the healthcare arena, a brief overview of teamwork described in the medical literature follows. A description of the MedTeams project and research is then presented. How CRM may be appropriately and effectively applied in healthcare, and future directions for CRM-based programs, are then discussed in the final section.

### Team Concepts in Healthcare

Health industry practitioners and academics have generated a large body of literature exploring the practical importance of teams and teamwork. One researcher traces the application of teamwork to healthcare to the beginnings of the twentieth century (Heinemann, 2002). Over this period team concepts have been formulated from two perspectives: management functions and care delivery. An example of team concepts from the management perspective is the differentiation of parallel, project, and management teams (Fried, Topping, & Rundall, 2000). *Parallel* and *project* teams are either permanent or temporary entities, frequently interdisciplinary, focused on a particular kind of output (e.g., continuous quality improvement activities, a new facilities plan), and responsible for delivering their work products to management. *Management* teams coordinate and direct elements of the healthcare organization. The term *work* teams has been applied to those groups of people who produce goods or deliver care to patients. Work teams are generally permanent fixtures of the organization, may have changing membership over time, and may consist of multidisciplinary members.

Examinations of care delivery teams have explored the various constellations of roles, functions, and disciplines that surround the make-up of these work teams. Figure 1 shows the major descriptive terms used for care delivery teams. Physician-nurse teams that have taken specific steps to improve communication and coordination are described as *collaborative*. Collaborative practice is an evolving construct, fraught with a complex history of cultural, professional, and gender impediments to effective teamwork (Alpert, Goldman, Kilroy, & Pike,

<sup>1</sup> Current affiliation, formerly with DRC



**Figure 1. Teamwork terms and configurations in health care organizations.**

1992). Hall and Weaver (2001) describe *multidisciplinary* work teams as a cooperative venture in which practitioners from various disciplines contribute to the patient's care. Care givers operate in parallel and are orchestrated by a physician in charge. Team members assess or treat the patient separately and share information with other team members. An *interdisciplinary* (or *interprofessional*) team applies to care givers from various disciplines who work together closely and communicate frequently to deliver care to the patient. The team is problem or patient-centered, meets frequently for consultations, and pools knowledge so that the resulting care to the patient is holistic. In a *transdisciplinary* team, boundaries among the individual team member roles are blurred, implying task sharing and a certain degree of substitutability of members. Although teams of various descriptions are pervasive in health care organizations (Fried, Topping, & Rundall, 2000), these team distinctions are not universally accepted (McCallin, 2001).

Skepticism about the effectiveness of teamwork is notable in the healthcare literature. Some of this is derived from the management and organizational psychology literature that reveals frequent failures in teamwork interventions (West & Field, 1995). Efforts to improve teamwork in healthcare have been hampered by "...differences in styles of learning, in career patterns, in models of working, and in regulatory mechanisms" (Doyal & Cameron, 2000). Other reticence reflects the importance that the health care industry places on evidence-based practice. For teamwork to be embraced, empirical evidence needs to show that teamwork is effective (Malone & Koblewski, 1999; Zwarenstein & Reeves, 2000). While examples of effective teamwork interventions do exist (e.g., Uhlig, Haan, Nason, et al., 2002; DeBehnke & Decker, 2002), cautions are raised that teamwork expectations frequently are not born out in practice (West & Field, 1995; Hall & Weaver, 2001).

Similar reservations also have been expressed with respect to CRM-based interventions. Zwarenstein and Reeves (2002) recognize that CRM does apply in high stress, high stakes environments such as the ED. However, they consider that a number of health care organization characteristics limits the applicability of CRM-modeled teamwork. These concerns include:

- Most of health care is provided in loosely structured, low-intensity settings such as physicians offices and outpatient departments
- Care teams may be spread across several geographically separated locations
- Time and space constrain much interaction to asynchronous communication
- Health care teams are larger and more complex than flight deck crews
- Contributors to a team may not perceive themselves as part of the team
- Every case is rendered unique by virtue of the interaction of the medical problem, the patient, and the caregiver environment
- Treatment protocols are not widely implemented

However, efforts to bring CRM into healthcare are underway. The patient safety movement specifically recommends CRM methodologies as a training approach to address patient safety issues (Kohn, Corrigan, & Donaldson, 1999; Pizzi, Goldfarb, & Nash, 2001). For more than a decade, the application of CRM methods and human patient simulation to improve anesthesiologists' ability to respond to medical crises, and enlist operating room resources to assist in resolving these crises, has resulted in a substantial reduction in anesthesia mishaps (Gaba, Howard, Fish, et al., 2001). Kosnik (2002) reports the use of videotaped reenactments of adverse events to identify the contributing factors and encourage the use CRM principles to change staff behaviors. And, the operating room has become a focus of efforts to bring CRM principles to bear on medical errors and team effectiveness (Helmreich & Schaefer, 1994; Calland, Guerlain, Adams, et al., 2002).

Since 1996 the MedTeams project has continued the transition of aviation CRM training to EDs. Initial research and development activities culminated in a field evaluation of the effectiveness of the ED MedTeams program. We review these developments, starting with the needs assessment that confirmed the need for a teamwork intervention, and continuing through a description of the project and the results of the operational evaluation.

### **Teamwork Needs Analysis**

Behavioral scientists and emergency care subject matter experts, trained in CRM teamwork principles, conducted an assessment of current weaknesses and error patterns in emergency medical teamwork and projected the potential impacts of improved medical teamwork on emergency care cost and performance. Because one of the major benefits of teamwork is its ability to prevent or mitigate errors, we chose to examine situations where medical errors had occurred in EDs and to assess the extent to which effective teamwork could have eliminated the errors. This led us to examine both closed malpractice cases (incidents where a lawsuit was initiated and resolved) and open risk cases (incidents that have or may become active lawsuits) (Risser, Rice, Salisbury, et al., 1998).

Eight hospitals from different states and regions of the United States participated in the teamwork failure case review. Specially trained physician-nurse pairs, drawing on 68 closed cases covering 4.7 million patient visits for the 11 year period ending in 1996, found that 29 cases (43%) revealed teamwork failures that could have been mitigated or prevented had effective teamwork occurred. The analysis revealed an average of 8.8 (range: 1 to 32) teamwork failures per closed ED malpractice or open risk case surveyed. For the 29 closed cases, the results indicated that improved teamwork, on average, would save approximately \$560,000 per case for those closed cases where teamwork could have influenced the outcome (i.e., prevent or mitigate the error). This translates into the conclusion that \$3.45 of the cost of every patient visit to an ED is attributable to litigation costs associated with poor teamwork. Note, however, that these potential savings, based primarily on indemnity payments made to patients and their attorneys, understate the true cost. The true costs of teamwork errors in terms of inefficiencies, additional hospitalization costs, patient economic losses and other factors lead us to believe that poor teamwork is a major cost of doing business in the ED.

### **ETCC Development and Curriculum**

Based on over 250 hrs of ED observations, ED teamwork processes were categorized into five dimensions: (a) Maintain Team Structure and Climate, (b) Apply Problem Solving Strategies, (c) Communicate with the Team, (d) Execute Plans and Manage Workload, and (e) Improve Team Skills. Forty-eight specific teamwork behaviors were associated with the five team dimensions. Detailed behaviorally anchored rating scales (BARS), descriptions of teams performing

at superior, average, and very poor levels, were constructed.

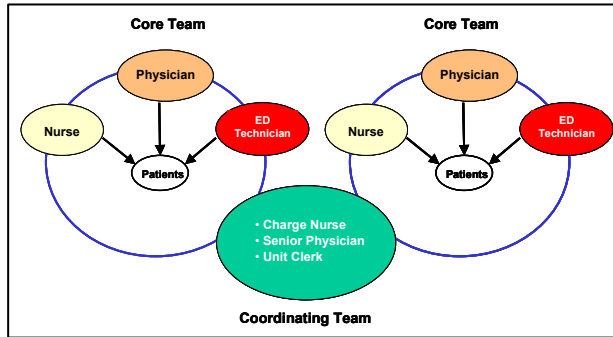
Using a model of evaluation-driven instructional development, the BARS served as the basis for the Emergency Team Coordination Course (ETCC™) curriculum and evaluation instruments. The initial draft curriculum was taught to over 150 ED staff members at Madigan Army Medical Center, a tertiary care facility, which continued to serve as a teamwork “laboratory” to help refine the course content and monitor teamwork implementation. Curriculum review and refinement was guided by ED physicians and nurses representing 12 hospitals of various sizes from around the country and representatives from professional medical and nursing societies meeting during five separate week-long Expert Panels.

The curriculum consists of an 8 hr block of classroom instruction organized with an introduction, five main learning modules, and an integration unit. Additional supplementary material includes a 50 min video depicting examples of good and poor teamwork. The course uses a train-the-instructor approach. That is, a physician-nurse pair from each participating hospital completes the ETCC and additional facilitator training, and then proceeds to instruct the entire ED staff at their institution. Practicums, coaching, mentoring, and review sessions constitute further learning experiences provided by the instructor pair and associate instructors subsequent to the classroom instruction. Students receive continuing education credit for the course.

Once all the ED staff completed the training, the teamwork implementation phase was initiated on an established start date. This phase was characterized by (a) forming teams by shift and delivering care in a team structure, (b) completing a 4 hr practicum with each staff member during which teamwork behaviors were practiced and critiqued by an instructor, and (c) coaching and mentoring of teamwork behaviors by instructors and associate instructors during normal shifts. The basic team structure is shown in Figure 2. One or more core teams deliver direct care to patients, the coordinating team manages resources and workflow, and ad hoc resuscitation teams are formed for emergent events. Further details of the training can be found in Risser, Simon, Rice, et al. (1999) and Morey, Simon, Jay, et al. (2002).

### **ETCC Evaluation**

Nine hospital EDs enrolled in a prospective, quasi-experimental untreated control group experiment with one pretest and two posttests to examine the



**Figure 2. Basic team structure in MedTeams.**

effectiveness of the ETCC course and teamwork implementation (Morey, Simon, Jay, et al., 2002). The training intervention was conducted from May 1998 to March 1999. Six hospitals were allocated to the experimental group to allow for civilian-military and teaching-community setting variations. Data collection periods were 30 days in duration and occurred in May 1998 (Period 1), October 1998 (Period 2), and March 1999 (Period 3). The intervention occurred between Period 1 and Period 2 for the experimental group. Control EDs agreed to delay training until after Period 2, which precluded evaluation of their intervention.

Five of the hospitals were civilian and four were military; five were teaching and four were community hospitals. A total of 684 physicians, nurses and technicians were trained in the experimental group and 374 physicians, nurses, and technicians were trained in the control group. Three outcome constructs were assessed: team behaviors, attitudes and opinions, and ED performance. Statistically significant improvements were obtained in the experimental group for each of these three areas of measurement. The quality of team behaviors improved by 75%, workload was not increased by practicing teamwork, and staff attitudes towards teamwork were enhanced by 6%. The most important finding from the evaluation was that clinical errors were substantially and significantly reduced by 56% in the experimental group when compared to the control group and 86% absolutely. A clinical error was defined as any clinical task that actually or potentially put a patient at risk. These errors were witnessed by a specially trained ED nurse or physician observing cases for the purpose of rating teamwork behaviors. An example of a reported error occurred during a resuscitation. A burn patient received duplicate administrations of intravenous morphine when two nurses independently administered the drug after a physician gave a verbal order. The staff recognized the overdose when the patient's breathing slowed, at which point they intervened and the patient recovered. A check-back for a verbal medical order, a teamwork

behavior taught in MedTeams, may have avoided or "captured" this error.

## Discussion

Anesthesia Crisis Resource Management (ACRM) training and the MedTeams program currently are the only two empirically-based, fully developed applications of CRM in healthcare (Pizzi, Goldfarb, & Nash, 2001). Practitioners are beginning to apply CRM techniques to raise awareness of team issues in medical error (Kosnik, 2002), and to develop interventions for the operating room (Calland, Guerlain, Adams, et al 2002), the cardiac care unit (Uhlig, Haan, Nason, et al., 2001), and the intensive care unit (Pronovost, Wu, Dorman, et al., 2002). This emergence of CRM-based operational improvements is closely tied to other improvements based on human factors considerations. The patient safety movement has championed the search for systems-level solutions, of which teamwork is just one part (Helmreich, 2002). The appreciation of larger human factors issues, and a skepticism about teamwork solutions, may be the reason the health care industry has not rushed to a set of CRM solutions. Another may be that the literature about health care teams focuses on the roles and functions of team members and the stages of team formation and maturation. Interest is invested in the factors associated with the building and maintaining teams, but scant attention is paid to the process of how to act as a team.

Methods for improving team process are well documented (Salas, Fowlkes, Stout, et al., 1999), but these successful methods are overlooked in the healthcare team literature (e.g., Heinemann & Zeiss, 2002). MedTeams has demonstrated that CRM can be successfully adapted for the high risk, high stakes environments of ED teams. However, our experience with MedTeams has revealed that behavioral skill training is not sufficient for teamwork to quickly take hold in CRM-trained staff. Part of the problem is the differences in the environments of aviation and health care, and the problems that have to be solved to make the transition of CRM from one domain to the other successful. Some of these differences are shown in Table 1, together with the solutions that were designed into the MedTeams system. These and other issues on implementing MedTeams are described in Morey and Salisbury (2002).

The MedTeams project is currently developing team training for hospital labor and delivery (L&D) units, the operating room, and intensive care units. A multi-site validation of the MedTeams L&D program is underway. Efforts are continuing to develop a hospital-wide MedTeams program that provides basic teamwork skills

**Table 1. Comparison of Army aviation and healthcare environments affecting CRM training**

<b>Feature</b>	<b>Aviation Environment</b>	<b>Healthcare Environment</b>	<b>MedTeams Approach</b>
Leadership	<ul style="list-style-type: none"> <li>• Unified command structure</li> <li>• Top-down policies promote CRM</li> <li>• CRM permits flexibility in flight crew leadership functions</li> </ul>	<ul style="list-style-type: none"> <li>• Separate departments of medicine, nursing, administration</li> <li>• Collaborative practice between medicine and nursing not universally effective nor accepted</li> <li>• Legal and cultural restraints on effective leadership in care delivery</li> <li>• Culture of physicians oriented toward individual performance</li> <li>• Blurry lines of authority in the workplace</li> </ul>	<ul style="list-style-type: none"> <li>• Specific responsibilities at CEO, Director, and Department levels for supporting the program</li> <li>• Teams establish leaders</li> <li>• Team and situational leadership functions articulated for core and coordinating teams</li> <li>• Physicians, nurses, and department staff responsible to each other</li> </ul>
Training	<ul style="list-style-type: none"> <li>• Extensive training infrastructure</li> <li>• Centralized requirements with local variation</li> <li>• Rigorous training to become an Instructor Pilot</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of centralized training mission</li> <li>• Instructor qualifications vary</li> </ul>	<ul style="list-style-type: none"> <li>• Develop training cadre</li> <li>• Deliver locally-tailored initial and refresher training at departmental level</li> <li>• Instructors certified to teach after receiving week-long specialized training</li> </ul>
Program Sustainment	<ul style="list-style-type: none"> <li>• Yearly training cycles</li> <li>• Peacetime training missions</li> <li>• Instructor pilots in each unit</li> <li>• Training budget</li> </ul>	<ul style="list-style-type: none"> <li>• Continuing education the responsibility of individual care givers</li> <li>• Individual, not team-oriented training</li> <li>• Departments can not stand down for training</li> </ul>	<ul style="list-style-type: none"> <li>• Trainers are members of department</li> <li>• Teamwork reviews of incidents, shifts, specific cases (i.e., M&amp;M rounds)</li> <li>• Training can be modularized</li> <li>• Coaching and mentoring of team behaviors</li> <li>• Release time provided for training</li> </ul>
Team Organization	<ul style="list-style-type: none"> <li>• Teams inherent to military missions, organizations, and training</li> </ul>	<ul style="list-style-type: none"> <li>• Multidisciplinary teams and work teams</li> <li>• No training in teamwork processes</li> </ul>	<ul style="list-style-type: none"> <li>• Teach specific teamwork behavioral skills</li> <li>• Devise a teamwork structure for shift work</li> </ul>
Program Evaluation	<ul style="list-style-type: none"> <li>• Accident statistics available and published</li> <li>• Field exercises and after action reports</li> <li>• Mission readiness reports</li> </ul>	<ul style="list-style-type: none"> <li>• Teamwork not a component of CQI programs or operational statistics</li> <li>• Misadventures kept private</li> </ul>	<ul style="list-style-type: none"> <li>• Measurement suite available to chart program progress and identify areas needing additional training</li> </ul>
Technology to Support Training	<ul style="list-style-type: none"> <li>• Use of flight simulators</li> <li>• Distance learning</li> </ul>	<ul style="list-style-type: none"> <li>• Limited, but increasing use of human patient simulators</li> <li>• Procedure trainers not yet considered in teamwork context</li> </ul>	<ul style="list-style-type: none"> <li>• Teamwork training maximizes the usefulness of simulation</li> <li>• Components of teamwork training can be delivered via distance learning and web-based means</li> </ul>
Motivational	<ul style="list-style-type: none"> <li>• CRM is a component of aviator proficiency evaluation</li> <li>• Value of CRM captured in lessons-learned</li> <li>• Save one's own life and those of crew and passengers</li> </ul>	<ul style="list-style-type: none"> <li>• Teamwork not central to personnel evaluation</li> <li>• Reliance on individual accountability</li> <li>• Personal decision to enhance effectiveness</li> <li>• Gain continuing education credits</li> </ul>	<ul style="list-style-type: none"> <li>• Cultural change to team-based work environment</li> <li>• Development of teamwork norms</li> <li>• Teamwork a component of personnel evaluation</li> <li>• Teamwork contributes to staff and patient satisfaction</li> <li>• Required for all ED personnel</li> <li>• Gain continuing education credits</li> <li>• Enhance patient safety and presumably reduce risk of malpractice</li> </ul>

to all staff, and more tailored skills for selected units within the hospital. The goals of these efforts are to demonstrate that CRM-based team training is more

broadly applicable than has been suggested in the healthcare literature.

## References

- Alpert, H. B., Goldman, L. D., Kilroy, C. M., & Pike, A. W. (1992). 7 Gryzmish: Toward an understanding of collaboration. *Nursing Clinics of North America*, 27 (1), 47-59.
- Calland, J. F., Guerlain, S., Adams, R. B., Tribble, C. G., Foley, E., & Chekan, E. G. (2002). A systems approach to surgical safety. *Surgical Endoscopy*, 16, 1005-1014.
- DeBehnke, D., & Decker, M. C. (2002). The effects of a physician-nurse patient care team on patient satisfaction in an academic ED. *American Journal of Emergency Medicine*, 20 (4), 267-270.
- Doyal, L., & Cameron, A. (2000, April 15). Reshaping the NHS workforce. *BMJ*, 320, 1023-1024.
- Fried, B. J., Topping, S., & Rundall, T. G. (2000). Groups and teams in health services organizations. In S. M. Shortell & A. D. Kaluzny (Eds.), *Health care management: Organization design and behavior* (4<sup>th</sup> ed., pp. 154-190). Albany, NY: Delmar.
- Gaba, D. M., Howard, S. K., Fish, K. J., Smith, B. E., & Sowb, Y. A. (2001). Simulation-based training in anesthesia crisis resource management (ACRM): A decade of experience. *Simulation and Gaming*, 32 (2), 175-193.
- Hall, P., & Weaver, L. (2001). Interdisciplinary education and teamwork: A long and winding road. *Medical Education*, 35, 867-875.
- Heinemann, G. D. (2002). Teams in health care settings. In G. D. Heinemann & A. M. Zeiss (Eds.), *Team performance in health care: Assessment and development* (pp. 3-17). New York: Kluwer Academic/Plenum Publishers.
- Helmreich, R. L. (2002, April). *Managing threat and error*. Presentation at the National Patient Safety Foundation Annenberg IV. Patient Safety: Let's Get Practical, Indianapolis, IN.
- Helmreich, R. L., Merritt, A. C., & Wilhelm, J. A. (1999). The evolution of crew resource management training in commercial aviation. *International Journal of Aviation Psychology*, 9 (1), 19-32.
- Helmreich, R. L., & Schaefer, H-G. (1994). Team performance in the operating room. In M. S. Bogner (Ed.), *Human error in medicine* (pp. 225-253). Hillsdale, NJ: Erlbaum.
- Kohn, L. T., Corrigan, J. M., & Donaldson, M. S. (Eds.). (1999). *To err is human: Building a safer health care system*. Washington, DC: National Academy Press.
- Kosnik, L. K. (2002). The new paradigm of crew resource management: Just what is needed to reengage the stalled collaborative movement? *Journal of Quality Improvement*, 28 (5), 235-241.
- Leedom, D. K., & Simon, R. (1995). Improving team coordination: A case for behavioral-based training. *Military Psychology*, 7, 109-122.
- Malone, D. M., & Koblewski, P. J. (1999). Professionals' attitudes and perceptions of teamwork supporting people with disabilities. *Journal of Developmental and Physical Disabilities*, 11 (2), 77-89.
- McCallin, A. (2001). Interdisciplinary practice—a matter of teamwork: An integrated literature review. *Journal of Clinical Nursing*, 10, 419-428.
- Morey, J. C., & Salisbury, M. (2002). Introducing teamwork training into healthcare organizations: Implementation issues and solutions. In *Proceedings of the Human Factors and Ergonomics Society 46<sup>th</sup> Annual Meeting*, (pp. 2069-2073). Santa Monica, CA: Human Factors and Ergonomics Society.
- Morey, J. C., Simon, R., Jay, G. D., Wears, R. L., Salisbury, M., Dukes, K. A., & Berns, S. D. (2002). Error reduction and performance improvement in the emergency department through formal teamwork training: Evaluation results of the MedTeams project. *HSR: Health Services Research*, 37 (6), 1553-1581.

*Proceedings of the 12<sup>th</sup> International Symposium on Aviation Psychology*

- Pizzi, L., Goldfarb, N. I., & Nash, D. B. (2001, July). Crew resource management and its applicability in medicine. In A. Markowitz, (Ed.), *AHRQ Evidence Report/Technology Assessment. Number 43* (AHRQ Publication 01-E058, pp. 505-513). Rockville, MD: Agency for Healthcare Research and Quality.
- Pronovost, P., Wu, A. W., Dorman, T., & Morelock, L. (2002). Building safety into ICU care. *Journal of Critical Care, 17* (2), 78-85.
- Risser, D. T., Rice, M. M., Salisbury, M. L., Simon, R., Jay, G. D., Berns, S. D., and The MedTeams Consortium. (1999). The potential for improved teamwork to reduce medical errors in the emergency department. *Annals of Emergency Medicine, 34*, 373-383.
- Risser, D. T., Simon, R., Rice, M. M., & Salisbury, M. L. (1999). A structured teamwork system to reduce clinical errors. In P. L. Spath (Ed.), *Error reduction in health care* (pp. 235-278). San Francisco, CA: Jossey-Bass.
- Salas E., Fowlkes, J. E., Stout, R. J., Milanovich, D. M., & Prince, C. (1999). Does CRM training improve teamwork skills in the cockpit?: Two evaluation studies. *Human Factors 41*, 326-343.
- Uhlig, P. N., Haan, C. K., Nason, A. K., Niemann, P. L., Camelio, A., & Brown, J. (2001, March). Improving patient care by the application of theory and practice from the aviation safety community. *Proceedings of the 11<sup>th</sup> International Symposium on Aviation Psychology* [CD-ROM]. Columbus, OH: Ohio State University Department of Aviation.
- West, M., & Field, R. (1995). Teamwork in primary health care. 1. Perspectives from organisational psychology. *Journal of Interprofessional Care, 9* (2), 117-122.
- Zwarenstein, M., & Reeves, S. (2002). Working together but apart: Barriers and routes to nurse-physician collaboration. *Journal of Quality Improvement, 28* (5), 242-247.