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IN

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## LEARNING OBJECTIVES

1.

*To explore the real benefits of teamwork as it applies to patient safety and the means by which effective teams can be trained through the MedTeams program currently used in both civilian and military emergency departments.*

2.

*To review the rules of engagement for U.S. military medicine, particularly as applied to the Law of Armed Conflict.*

3.

*To learn the means by which experts at the Armed Forces Institute of Pathology identified victims of the recent terrorist attack on the Pentagon.*

4.

*To highlight the MedMARx medication error reporting program and demonstrate how it can enable individual medical facilities to learn from the mistakes of others.*

5.

*To familiarize the medical practitioner with several different types of trocars and the liability risks associated with each of them.*

6.

*To determine the reasons why errors may not be reported in a patient safety program and to discuss how this cultural mindset can be overcome.*

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## **BEYOND RHETORIC:**

# **TEAMWORK, A REAL RESPONSE TO PATIENT SAFETY**

*By Mary L. Salisbury\**

*With Commentaries by Matthew Rice, M.D., J.D.\*\* and Albert W. Wu, M.D.\*\*\**

**At the writing of this article the dust and ash are still settling over the ruins of the once towering World Trade Center, in New York City. This is a time of crisis for our country and in a very different manner and on a very different scale, it is a time of crisis in our country's health care. As if never before heard, "patient safety speak" has permeated our discussions, education, and medical care arenas. Equally important to note is the fact that while caregivers believe the concept of safety coupled with patient care delivery is always the intent ("first do no harm") the reports of many agencies indicate that such is not always the case.**

The role of the physician is key to ensuring patient safety and given solid achievable actions all physicians can engage in and achieve this outcome. Legislation, standards, and patient safety ideals alone cannot address the issue of care delivery error, for error remains attached to and inherent in the human condition. No solution is complete without first recognizing and then controlling the fallibility of humans. Teamwork provides a concrete solution to patient safety issues that individuals can control.

The specific aim of this article is to 1) describe the current state of health care and the evolution of patient safety initiatives, 2) summarize the history and current perspective on medical error and present a case study of a comprehensive teamwork system that provides a solid response to the reality of human error.

### **Evolution of Patient Safety Solutions**

Historically, it was generally accepted that the proclivity to err was absolute. Scientific scrutiny of human error is relatively young with contributors to this base of knowledge hailing from the disciplines of cognitive psychology, human factors engineering, organizational development, systems engineering, medicine, and nursing. Errors are believed to occur in patterns and in some circumstances to be predictable 1

Establishing the National Patient Safety Foundation in 1997 ushered in the first groundbreaking report of the Institute of Medicine (IOM).<sup>2</sup> It highlighted the huge number of medical errors that occur and created an arena of patient safety awareness for professionals and the communities they serve.

The impact of this IOM-I report on patient safety resulted in medical error and patient safety emerging as a national problem of epidemic proportions. Indirect results of the IOM-I report were increases in both the federal funding for patient safety initiatives and the national focus on medical error reduction programs in all 5000 plus U.S. hospitals. These impacts are congruent with the marketplace whereby third-party payers demand that patients have increased access to cost effective quality care accompanied by an increased use of evidence-based research to improve clinical outcomes.

The IOM-II report, "Crossing the Quality Chasm,"<sup>3</sup> issued a call for "action to improve the American health care delivery system as a whole, in all its quality dimensions for all Americans. The report sets forth six specific aims, stating that health care should be safe, effective, patient centered, timely, efficient, and equitable. The "what" of the report is a gripping call to action--a call to provide access to safe, cost-effective care for all communities with a specific eye to vulnerable populations. The "why" of the report is the shearing reality gap--a gap that exists between the overwhelming wealth and availability of knowledge and technology and the equally overwhelming inability to make that knowledge and technology available to patients and their providers. Individuals struggle to make sense of it all.

### **Pulling It All Together**

Integrating the myriad of patient safety reports, challenges, and initiatives are multiple agencies and disciplines creating multiple agendas. With diverse agencies and disciplines exerting influence in an attempt to govern direction, it is no wonder that providers feel overwhelmed and confused regarding how to proceed. This condition places providers at risk for action impotence. Established by order of President Clinton and convened by the Secretary of Health and Human Services, the Quality Interagency Coordination Task Force (QuIC)<sup>4</sup> noted that among many proposed solutions teamwork emerged as one method for achieving safe patient outcomes. Teamwork is one method by which providers can make sense of their world.

Caregivers organized into health care teams deliver improved outcomes<sup>5</sup>. Teamwork is multi-dimensional; individuals bring to bear their clinical skill sets and exercise those skills while functioning within their team role. As team members, individuals coordinate teamwork activities achieve the expected work outcomes<sup>6</sup>. Moreover, teamwork meets the IOM challenges set forth in reports I and II because effective teams deliver improved-quality care that is patient-centered and safer. Teamwork deductively and intuitively makes sense. The following case study provides one model of teamwork training that exemplifies this premise.

### **MedTeams as a Teamwork Training System<sup>7</sup>**

Dynamics Research Corporation (DRC) first delivered its teamwork training concept called the "Emergency Team Coordination Course" to the United States government in the field of Army aviation, but strong parallels had been observed between the fields of tactical aviation and emergency medicine.<sup>8</sup> The delivery of emergency medical care, like aviation, is comprised of events in which individuals (a) undertake time-compressed, critical decisions and actions often based on incomplete information; (b) demand effective coordination from multidisciplinary professionals; and (c) understand that poor decision making and performance can lead to costly or deadly results.

Despite the obvious parallels it was important that the teamwork principles and lessons learned in aviation were reviewed, adapted, and adopted by emergency medical care providers.<sup>9</sup> Under review of the federal government, this task was executed by the MedTeams Subject Matter Expert (SME) panel. This SME panel was comprised of military and civilian emergency care physician:

and nurses from across the country, a cadre of knowledgeable consultants, emergency care professional societies, and clinical and behavioral experts from DRC. The MedTeams SME par worked to adapt aviation oriented teamwork training to the field of emergency medical care delivery, evaluate the effectiveness of MedTeams in operational settings, and establish the behaviors necessary to sustain and integrate MedTeams, over time, into a true culture change.

### **Needs Assessment: Teamwork in Emergency Health Care**

To determine need, the initial MedTeams work involved a closed case review.<sup>10</sup> Physician and nurse pairs systematically reviewed 68 medical malpractice claims that arose through 4.7 million patient visits (in both civilian and military settings) from 8 emergency departments across the country. They tallied 476 teamwork failures (an average of 7 failures per claim) and concluded in each case effective teamwork may have prevented patient harm or injury, avoided more than half the documented deaths, and eliminated expensive litigation.

Behaviors that prevented teamwork failures were documented and subsequently integrated into core curriculum that would be made available to emergency departments. Central to that curriculum development was a fourfold premise that:

(1) Teamwork behaviors are a learnable set of skills.<sup>11</sup>

(2) Individuals trained and skilled in the behaviors of teamwork are equipped to work together delivering more reliable high-quality, patient-focused care with improved outcomes, as well as enhanced patient and staff satisfaction.<sup>12</sup>

(3) Each member of the team remains responsible and accountable to maintain an awareness of the patient's assessment and plan of care and to advocate and assert a position on behalf of the patient. This action is key to breaking the chain of errors.<sup>13</sup>

(4) Most errors unfold over an extended period of time, are observable and recognizable, and therefore are interruptible.<sup>14</sup>

### **Study Results**

MedTeams outcomes were validated in 9 civilian and military hospital emergency departments across the country.<sup>15</sup> Collected data demonstrate the effectiveness of improved team performance in delivering safe, effective, patient-centered care as evidenced by a significant drop in observed error rates, improved patient perception of care received, and anecdotal evidence of reduction in risk cases.<sup>16</sup>

### **MedTeams Today**

MedTeams remains dynamic in its curriculum and implementation processes and continues to provide caregivers the principles and practical skills of teamwork. MedTeams behaviors remain organized around the five dimensions common to highly effective teams: (1) maintaining team structure and climate, (2) planning and problem solving, (3) communication, (4) workload management, and (5) improving teamwork skills.

Team Structure and Climate. The organizational model and care delivery unit of MedTeams is 1 team. MedTeams ensures clear team roles, standardized terms and processes, and simplified procedures, educating staff and leadership alike. Each team member clearly knows which team he or she belongs to, which patients are assigned to that team, and how to perform as a team member. Team leaders are trained in the skills, duties, and responsibilities required to create and maintain the team structure and climate and that are essential for establishing and maintaining

team behaviors over time. They are also taught the system precursors and preconditions that lead to error.

Plan and Problem-Solve. In MedTeams, the act of establishing and communicating a patient's plan of medical treatment is essential to ensure that that information moves from being a mental model held by a single individual to that of a shared model maintained and implemented by a team. All team members effectively cross monitor the actions of each other against the established plan. When the actions of a provider deviate from the expected actions, any team member who recognizes that difference should advocate and assert a position on behalf of the patient. The assumption underpinning this concept is an unstated, "I have information that you do not. If you had this additional information, it would alter the patient's plan of care." This action effectively traps the active error as it unfolds, and manages or mitigates its outcome.

Team Communication. Effective communication ensures that all team members contribute information to further the patient's medical care. Promoting and maintaining situational awareness ensures maximal flow of information to the key decision makers. This information enables the patient to receive the proper plan, accompanied by the correct prescriptions and procedures, resulting in the best possible outcome. Such training teaches providers the concrete actions required for proper and appropriate communication, establishes the common language necessary for understanding the actions of team members, and offers teams the practical skills of communicating through conflict and across authority gradients to achieve successful conflict resolution.

Manage Workload. Early research indicates that patients are most at risk when provider workload is particularly high or low.<sup>17</sup> MedTeams trains staffs to identify workload issues, prioritize patient care, and ensure that priority-based outcomes occur. It should be noted, however, that in this program workload management as a patient safety solution is not a substitute for proper and appropriate staffing.

Improve Team Skills. This establishes the expectation for coaching, mentoring, and role-modeling new behaviors while providing a concrete framework for the formal and informal feedback, sharing, and reviewing of lessons learned. All feedback is anchored in and measured against the MedTeams standards, thus preventing any tendency to normalize system deviance. Lessons learned are reviewed individually by case, such as in Morbidity and Mortality reviews, and collectively, such as in the end-of-shift review. Feedback, shared and integrated into practice, serves to improve processes by addressing system failures and to enhance the safe delivery of care by expanding the core capabilities of providers.

## **Summary**

Teamwork is a powerful patient safety tool and MedTeams is one successful model of teamwork training that demonstrates this effect. In fact, a Military Health System (MHS) Joint Overview Statement about the DoD quality-monitoring program specifically lists and includes the MedTeams program as part of the MHS ongoing quality initiative to improve patient safety.<sup>18</sup> The MedTeams Research Project concluded that MedTeams equipped clinically expert caregivers to work as a team and to organize their patient care around the goal of the right care delivered in the right way by identifying, capturing, and managing or mitigating the active or latent error. MedTeams ensures an understanding of a multidisciplinary, behavioral approach to patient safety, the creation of safe outcomes that promote error reduction, while reinforcing accountability from all team members.

MedTeams cannot solve everything, however. It is not a substitute for proper and appropriate

staffing, nor a substitute for excellent clinical skills. It does not work overnight.

Obviously, more information is needed. On behalf of the federal government, MedTeams research continues in additional medical arenas such as labor and delivery, and to date needs assessments indicate that while the etiology of error has been largely defined, the outward manifestation of error may be unique within different services. This finding leads researchers to hypothesize that while a training product may be transportable and transferable, it may need to be service-specific adapted. The solid steps of an evidence-based, multi-disciplined, medical care delivery model can be used successfully to mobilize caregivers towards engaging the concrete actions that ensure safe, effective, patient-centered care. To this end, teamwork provides a solid solution.

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## **COMMENTARIES**

### **Beyond Rhetoric**

The challenges of practicing medicine today are greater than at any time in the past quarter century. Societal demands, regulatory imperatives, limited resources, changing professionalism and patient expectations make the practice of medicine at the "sharp end" extremely demanding. Practicing medical professionals often leave work drained, less than satisfied, and concerned about their ability to cope with the constant stresses. The focus on patient safety adds a new dimension of concern for medical professionals and challenges to medical systems looking for answers. Some answers and solutions already exist, however. This article briefly reviews a well developed program that offers a practical solution to the nagging problem of failures associated with lack of teamwork. The Institute of Medicine reports I and II both recognized the need to improve teamwork in the medical arena. Industries outside of medicine have long recognized teamwork as critical, yet there is little to no training in medicine that focuses on teamwork. It is simply assumed that you learn how to perform as a team. The MedTeams program is an option to help fill the void in team training. It provides practical solutions in complicated medical environments while addressing issues in patient safety. MedTeams is based on the successes in aviation and other high-risk industries in preventing error. It focuses on improving safety using human behavior modification and teamwork. This seems easy and logical, but without specific training, practical tools, and commitments associated with MedTeams similar efforts often fail. The question is not whether this approach can work, but rather how quickly the applications of this

program can be adapted and implemented in all areas of medicine. The struggle to improve patient safety in an already complicated medical world can be made easier by learning from and utilizing existing programs and committing to their success. This is critical to patients and professionals as we look for additional answers in parallel areas of the patient safety movement.

*Matthew M. Rice, MD, JD, FACEP*

*In Defense of Rhetoric: Teaching Teamwork to Improve Patient Safety.*

Suppose that American football players were trained in the following manner. Players would be instructed in the skills of throwing, catching, tackling and blocking, and then would retire to practice individually. They would read playbooks, memorize signals, and occasionally quiz one another about them. Every Sunday, two groups of players would assemble on the gridiron for a game. In the huddle, they would decide on the spot how to proceed. The quarterback would call the signals, and players would do their best to execute the plays. Most players and coaches would agree that this would inevitably lead to missed hand-offs, incomplete passes, and other broken plays. The game would lack the precise timing and coordination that characterize a well played game. These skills are only accomplished by team training.

The situation described above is analogous to the training of physicians in American medicine. Physicians and other caregivers assemble in groups to care for their patients in the operating room, labor and delivery suite, emergency department, intensive care unit, or hospital ward. These groups vary in size and in the tasks they set out to accomplish, but have in common the goal to coordinate their efforts on behalf of the patient. They are even referred to as "the health care team." Strangely, however, they rarely "practice" together - to run through routine "plays" over and over, drills for specific critical situations, with continuous assessment and feedback. At this kind of team training is restricted to a very few situations, such as simulations in learning Advanced Cardiac Life Support. Unfortunately, most team training occurs on live patients. Reflecting on this, it is not surprising that there are medical errors which are the product of failure of coordination and communication.

In the accompanying article, Salisbury describes MedTeams, a program established by the Dynamics Research Corporation (DRC) to extend team training into medical care. MedTeams adapts the methods of crew resource management training that has resulted in remarkable safety achievements in the aviation industry. The model has met with early success. In an initial application to emergency medicine, DRC noted specific teamwork failures that could lead to medical errors, including failure to 1) identify an established protocol or to develop a treatment plan for the patient's care, 2) advocate and assert an alternative or corrective course of action when a question arose about the patient's care, 3) prioritize caregiver tasks for the patient, and cross-monitor actions of other team members.<sup>1</sup> These failures point to improved behaviors that can be learned and potentially measured, and to a tangible opportunity to improve patient safety.

As MedTeams and other efforts to improve team functioning are applied to medicine, educators will be challenged to demonstrate that training translates into actual improvements in patient outcomes. To date, there have been no randomized clinical trials of formal teamwork training in medicine. We need to refine and validate ways of measuring good processes of care, including team behavior, that are applicable to different specialties and practice settings. We also need to develop practical methods to measure medical errors and adverse patient outcomes.

Of course, patient safety is only one aspect of good quality care. Improved team functioning is likely to have other important benefits. For example, there are recent reports that in group practices in which practitioners "reported better team climate," their patients reported higher patient satisfaction, access to care, and continuity of care.<sup>2</sup> It is also likely that the satisfaction of clinicians will be improved by working in a better team environment.

In closing, it seems appropriate to speak in defense of rhetoric. In today's parlance, the term is usually used to connote style over substance; language that is elaborate but empty. However, an older definition of rhetoric is "the art or study of using language effectively and persuasively." Is this in fact much of what MedTeams is all about?

*Albert W. Wu, M.D., MPH*

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## Rules of Engagement for U.S. Military Medicine

By Jason F. Kaar, J.D., MAJ, USAF\*

*Portions of this article are based on presentations made at the 2001 Law of Armed Conflict for Military Medical Personnel Conference in Spiez, Switzerland in August 2001 co-hosted by the International Committee on Military Medicine.*

*The events of September 11, 2001 have altered the way warfare will hereafter be conducted at the way the United States military and military medicine will operate. The purpose of this piece is to remind military medical providers of the basic rules that apply to them regarding operations both inside and outside the United States, including the Law of Armed Conflict (formerly known as the Law of War). As you read this article, keep in mind one important point: the law as written is reactive, not proactive. Therefore the various conventions and treaties that apply to armed conflict are a direct result of what we now consider "conventional warfare" with easily identifiable enemies. While the way we will "fight" from now on has changed, the basic concepts of humanity - which these rules embrace - have not.*

### **Domestic Health Care Support**

As a general rule civilians are not entitled to health care from U.S. military personnel. There are notable exceptions, however. The Air Force, like the other services, has a provision that allows treatment of civilian emergencies even if the patient is not a statutory "beneficiary" of the Department of Defense (DoD) health care system.<sup>1</sup> In times of crisis, military medicine has responded by helping in any way it can. For example, immediately following the Oklahoma City bombing in April 1995, Wilford Hall Medical Center in San Antonio, Texas sent military medical teams to assist civilian medical personnel. Following the September 11, 2001 attack on New York City's World Trade Center, the Navy hospital ship USNS Comfort sailed to New York Harbor to assist with rescue operations.<sup>2</sup> Additionally, the Armed Forces Institute of Pathology continues to lead the way in identifying disaster victims, both military and civilian, by matching DNA samples obtained at disaster sites with those provided by family members or other sources.<sup>3</sup>

While the federal military<sup>4</sup> is prohibited from engaging in civilian "law enforcement activities,"<sup>5</sup> Congress has recognized important capabilities and medical expertise the military possesses. For example, under the provisions of 10 United States Code (USC) 382 military personnel, with approval of the Secretary of Defense, may be called upon to assist civilian authorities in emergency situations that involve chemical or biological weapons of mass destruction.

### **Overseas Humanitarian and Civil Assistance**

Federal law allows the military medical community to provide relief and assistance in foreign countries as long as certain conditions are met. With the passage of 10 USC 401, Congress authorized the Department of Defense, in coordination with the Department of State, to provide

when doing so promotes the security interests of both the United States and the host nation, as long as the activity provides operational readiness skills to those involved. It is important to note that the statute specifically prohibits the use of civil and humanitarian assistance funds<sup>6</sup> to directly or indirectly support any organization, group, or individual engaged in military or paramilitary operations.<sup>7</sup>

The source of supplies for humanitarian medical efforts is not limited to the DoD or the federal government. 10 USC 402 authorizes the Secretary of Defense to transport, on a space available basis, supplies deemed suitable for humanitarian and civil assistance. Once transported, they may be distributed by agencies of the U.S. government, a foreign government, an international organization, or a non-profit relief organization.<sup>8</sup> Therefore if, for example, a large U.S. corporation wished to provide humanitarian or disaster relief in another country but did not have transport readily available, if the U.S. military was "heading in that direction" and had space available, the military could (after obtaining proper clearances) transport the supplies.<sup>9</sup>

In general, rules for any humanitarian mission are determined by the unit involved, together with the Joint Command (such as EUCCOM) responsible for the region, the Department of State, and the host nation. It is important that any entity engaging in humanitarian or civilian aid ensures that it has clearances from all of the organizations involved.

### **Peacekeeping Operations**

Peacekeeping operations are governed by the mandate that established the peacekeeping force. Accordingly, rules for providing health care to the population within the geographic zone in which the peacekeeping force is located would be dictated by the governing mandate. In addition to the normal "military rules of engagement," there are "medical rules of engagement" that should be established as well. Normally it is considered best practice to limit care to those involved in the operation. Extending care to others may lead to the perception of favoring one side over the other. Worse yet, if a local individual were to die in a peacekeeper medical facility, regardless of the cause of death, the local population might view it as intentional. This could hinder peacekeeping efforts as well.

Additional problems for medical personnel begin with the initiation of hostilities, for once the shooting starts it is often difficult to determine where medical responsibility lies. If it is absolutely clear that peacekeeping forces are not engaged and have not fired, there is no responsibility to assist the local wounded. The burden for their care falls to the local medical community. If there is a question as to whether the peacekeeping force was involved in the wounding, absent clear evidence to the contrary, the obligation to provide medical care then falls on the peacekeepers. Once again this can be a tricky situation. Knowing that medical care available from the outside military peacekeeping force is superior to that of the local medical community may lead some indigenous people to claim they were injured by the peacekeepers instead of the opposing force. This may strain any limited military medical resources. Furthermore, once again the appearance arises of favoring one side over the other.

### **Armed Conflict**

While we have engaged in many battles and conflicts over the last six decades, the U.S. has not declared war since December 8, 1941. As a result we engage in "armed conflict," and thus follow the "Law of Armed Conflict" (LOAC). In order to apply the LOAC rules, the first order of business is to identify those involved. Generally there are three categories of people who are directly involved in armed conflict: non-combatants, combatants and illegal combatants.

Non-combatants include civilians, medical personnel,<sup>10</sup> and chaplains. Although non-combatants can be detained by opposition forces, they do not become prisoners of war, per se. While detained they may be required to continue with their professional duties for the benefit of prisoners of war. Once there is no longer a need for their services, international law requires that they be repatriated.<sup>11</sup> Captured auxiliary medical personnel (field medics, stretcher bearers, etc.) are deemed prisoners of war, but should be allowed to continue their medically related duties to the greatest extent possible.<sup>12</sup> Any military medical equipment that is captured by the opposing force may be retained as a war prize, but once captured it shall be used for medical purposes.<sup>13</sup>

An "occupying power has a duty to ensure that the medical needs of the civilian population in a occupied territory continue to be satisfied."<sup>14</sup> Civilian medical personnel and equipment may be temporarily requisitioned by an occupying force if there is an immediate need.<sup>15</sup> However, the occupying force must ensure that the medical needs of the local civilian population are met as well. Accordingly, a civilian undergoing treatment cannot be disengaged from that treatment so that a wounded military member may be cared for. Those providing care shall not be punished for carrying out those activities, and must be allowed to continue medical activities in accordance with standards relating to ethical medical treatment.<sup>16</sup>

According to the Hague Conference of 1907,<sup>17</sup> combatants are classified as: those who are "... commanded by a person responsible for his subordinates; have a fixed distinctive emblem recognizable at a distance; carry arms openly; and conduct their operations in accordance with the laws and customs of war." This includes distinguishing themselves from the general civilian population,<sup>18</sup> which can be accomplished by wearing some type of identifiable uniform. In countries where militia or volunteer corps constitute a portion of the combatants, they are included under the classification of "army." The targets of combatants' aggressions are military or military related, and they keep civilian collateral damage to a minimum.<sup>19</sup> Combatants do not specifically target the civilian population.<sup>20</sup> Once immobilized through injury, surrender or other means they must be accepted as prisoners <sup>21</sup> and must be afforded the rights of prisoners, including food, clothing, shelter and medical care.<sup>22</sup>

Illegal combatants are those who take up arms, but violate the letter and spirit of the law as it pertains to combatants. Illegal combatants are those often labeled as "terrorists." They do not wear a readily identifiable uniform, they do not openly carry arms, and they often specifically target innocent civilians. While illegal combatants must be captured and taken prisoner if the situation presents itself,<sup>23</sup> unlike prisoners of war they may be tried and punished for their actions.<sup>24</sup>

### **Medical Care in Armed Conflict**

Under the provisions of international law, in armed conflict the duty to provide medical care does not distinguish between friend and foe. All must be treated in accordance with the wounds or injury sustained. An enemy soldier must be provided medical attention equal to that of U.S. personnel.<sup>25</sup> The only exception to this rule is in the treatment of "walking wounded." Medical care providers are allowed to quickly "patch up" their own forces to quickly return them to the fighting.

Prisoners or internees shall not be subject to medical experiments, physical mutilation, or removal of tissue or organs for transplantation even if they consent to the procedure,<sup>26</sup> but they are allowed to knowingly and freely consent to the donation of blood and skin tissue for grafting.<sup>27</sup> Additionally, prisoners and internees have the right to refuse any surgical procedure.<sup>28</sup>

## Your Duty

Due to the nature of military medicine, medical personnel are often the first to see violations of the Law of Armed Conflict. For example, a child or an elderly farmer with bayonet wounds is taken to the military physician for treatment, or military personnel are victims of a chemical or biological attack (both of which are generally considered illegal weapons). When events of this nature occur it is the responsibility of the health care providers to report to military criminal investigators such as the Air Force Office of Special Investigations or through the appropriate chain of command to ensure that those responsible, regardless of which side they are on, are brought to justice.

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1. AFI 41-115, *Health Services*, Authorized Health Care And Health Care Benefits in the Military Health Services System (MHSS), July 25, 1994, paragraph 1.3.3 states: "At Air Force MTFs, civilian emergencies are authorized emergency care only. When the patient is medically stabilized, transfer to an appropriate civilian medical facility or discharge as appropriate."
2. Hill M. Navy ship helps rescue workers. *Associated Press wire*. September 18, 2001.
3. See Kelley C. Operation Noble Eagle: AFIP Responds to September 11th Pentagon Attack, at page 22 of this publication.
4. As opposed to the National Guard, which, unless pressed into federal service, is the State Militia responsible to the Governor of its particular state, not the U.S. President. While under the control of the Governor, the National Guard may engage in law enforcement activities.
5. DODD 5525.5, DoD Cooperation with Civilian Law Enforcement Officials, January 15, 1986 to Ch 1, December 20, 1989, ASD(FM&P).
6. 10 USC 401 (a)(3).
7. This does not mean the United States cannot support allied forces. It simply means we cannot use these funds for that support.
8. See 10 USC 402 (C)(1).
9. The President, under the provisions of 10 USC 404, has authority to respond to man-made or natural disasters with the armed forces, but in light of the specific nature of the statute it will not be addressed in this article.
10. Article 24 of the 1949 Geneva Convention defines medical personnel as those "exclusively engaged in the search for, or collection, transportation or treatment of the wounded or sick, or in the prevention of disease..." The key word is "exclusively." In other Articles of the Convention, hospital orderlies, nurses, and veterinarians are treated as combatants. This is probably due to the norms of 1949. Today, it is fairly well accepted that nurses and veterinarians involved in health care and public health fall within the definition of Article 24.

11. Article 28, Geneva Convention, August 12, 1949. For full texts of the Geneva Convention and other sources pertaining to the Law of Armed Conflict, see <http://www.vbs.admin.ch/internet/gst/kvr/e/sanreg1-e.htm>. Accessed November 4, 2001.
12. Article 29, Geneva Convention, August 12, 1949.
13. Article 33, Geneva Convention, August 12, 1949.
14. Article 14, paragraph 1, Additional Protocol I, June 8, 1977.
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16. Article 16, paragraph 1, Additional Protocol I, June 8, 1977.
17. For a full text of the Hague Conference of 1907, see <http://www.yale.edu/lawweb/avalon/avalon.htm>. Accessed November 4, 2001.
18. Article 44, paragraph 3, Additional Protocol I, from the 1949 Geneva Convention.
19. See generally Part IV of Additional Protocol I, from the 1949 Geneva Convention.
20. See specifically Article 51 of Additional Protocol I, from the 1949 Geneva Convention.
21. Article 40, paragraph 1, Additional Protocol I, June 8, 1977, specifically prohibits orders that provide no quarter to the enemy.
22. See generally Geneva Convention Relative to the Treatment of Prisoners of War of August 1949, as well as Article 11 of Additional Protocol I, from the 1949 Geneva Convention.
23. See generally Article 37 of Additional Protocol I, from the 1949 Geneva Convention.
24. See generally Section III, Treatment of Persons in the Power of a Party to the Conflict, Articles 72 - 75 of Additional Protocol I, from the 1949 Geneva Convention.
25. Article 10, paragraph 2 of Additional Protocol I, from the 1949 Geneva Convention.
26. Article 11, paragraph 2 of Additional Protocol I, from the 1949 Geneva Convention.
27. Id at paragraph 3.
28. Article 11, paragraph 5 of Additional Protocol I, from the 1949 Geneva Convention. It should be noted that the Protocol strongly advises health care practitioners to obtain a written statement signed or acknowledged by the patient, refusing the recommended care.

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## **Operation Noble Eagle:**

### **AFIP Responds to September 11<sup>th</sup>**

#### **Pentagon Attack**

*By Christopher C. Kelly*

*A multi-disciplinary team of more than 50 forensic specialists, scientists and support personnel from the Armed Forces Institute of Pathology (AFIP) played a major role in one of the most comprehensive forensic investigations in United States history following the September 11, 2001 terrorist attack at the Pentagon in Virginia, just outside Washington, DC.*

Code-named "Operation Noble Eagle," AFIP's team of forensic pathologists, odontologists, a forensic anthropologist, DNA experts, investigators and support personnel worked for over two weeks at the Dover Air Force Base Port Mortuary at Dover, Delaware to identify the 188 victims of the attack. "Our staff represented every branch of the service," said AFIP Director Glenn N. Wagner, CAPT, MC, USN, who served as senior officer during the operation.

The investigation mobilized AFIP assets in many ways. During the hours immediately following crash of American Airlines Flight 77 into the Pentagon, the acting Armed Forces Medical Examiner, Abubkr Marzouk, Col, USAF, MC, began working with FBI and local Virginia law enforcement officials to create an effective plan for first recovering and then identifying the victims. At the same time, personnel from the Office of the Armed Forces Medical Examiner (OAFME) positioned and staged equipment to begin operations at Dover. Bruce Ensign, LCDR, MC, USN served as AFIP's team leader at the site. "We immediately called in regional medical examiners from as far away as San Diego to participate," he said. A total of 12 forensic pathologists, assisted by two AFIP staff pathologists, headed the OAFME investigation team.

Also arriving at Dover during those early critical hours were two other key AFIP groups: forensic scientists from OAFME's Armed Forces DNA Identification Laboratory (AFDIL) and oral pathologists from the Department of Oral and Maxillofacial Pathology. AFDIL scientists ensured

that data systems and records were available to make DNA identifications, while the oral pathology group created a triage area to conduct dental identifications. Contacts were also made with family services personnel in each branch of the military to obtain antemortem information as reference material. Mortuary operations were fully underway by the evening of September 13, just two days after the attack.

AFIP utilized a well-defined and tested system for conducting the identifications of the Pentagon attack victims. When remains arrived at the morgue, a scanning device searched for the presence of unexploded ordnance or metallic foreign bodies. A computerized tracking system then assigned a number to each victim for efficient tracking. FBI experts collected trace evidence to search for chemicals from explosive devices and conducted fingerprint identifications. Forensic dentistry experts from the Department of Oral and Maxillofacial Pathology then performed dental charting and comparison with antemortem dental records. Full-body radiographs documented skeletal fractures and assisted in the identification process, followed by autopsy inspection.

At autopsy, forensic pathologists determined the cause and manner of death, aided by forensic anthropologist Dr. William C. Rodriguez to determine the race, sex and stature of victims for presumptive identification when necessary. A board-certified epidemiologist managed the tracking system for data collected during the autopsy process. Tissue samples were collected for DNA identification and further toxicologic studies. Forensic photographers -- essential to any forensic investigation -- documented injuries and personal effects. Finally, mortuary specialists embalmed, dressed and casketed remains prior to release to next-of-kin.

For eight days a full complement of AFIP forensic specialists worked twelve-hour shifts to complete the operation. "This is the largest mass fatality we've dealt with in recent years," Ensign said. "We have modalities today that we didn't have before. Our investigation was much more technology-intensive."

Ensign noted that the entire team worked well together. "Because of the combined effort of all three services and the FBI we were very pleased with the speed of the identification process. Essential records and references were submitted to us in a timely way." Logistical help from AF also played an important role. "We had tremendous logistical issues obtaining equipment, especially with additional demands in New York City and Somerset County, Pennsylvania," he said. "Fortunately our logistical support was terrific in helping us get material in."

Others also played essential roles. Histotechnicians from the Department of Scientific Laboratories served as autopsy technicians assisting pathologists with the remains, while special agents assigned by the various services helped in the investigation. "It was a terrific team effort," Ensign said.

According to Rodriguez, "This was the largest mass fatality we've seen in years, and it required hundreds of decisions to be made quickly and accurately. But our biggest concern was always the families. We worked hard to get the job done and return the victims to their loved ones."

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## Standardizing Medication Error Reporting Using MedMARx

By Ronald A. Nosek, Jr., MS Pharmacy, LCDR, MSC, USN,\*  
Michael P. Bourg, PharmD, LT, MSC, USNR,\*\* and Ms. Iria Pereira

*Approximately 44,000 to 98,000 deaths occur annually in the United States due to medical error, a number far greater than the annual number of deaths resulting from AIDS (>17,000), breast cancer (>42,000), or motor vehicle accidents (>43,000).<sup>1</sup> While medical errors do not always result in death, various studies have identified a large number of adverse events that do occur from them, particularly in the field of medication errors. In one such study, 28% of the adverse drug events (ADEs) occur as a result of errors, and 78% of these errors resulted from system failures.<sup>2</sup> Another study conducted over a six-month period at two tertiary hospitals showed that 28% of the actual ADEs were preventable. A second study showed that 49% of the errors occurred during ordering, 26% during medication administration, 14% when dispensing, and 11% during transcription.*

### Medication Error Reporting and Trending

Additional studies have examined the significance of reporting such medication errors. In the past, health care professionals have not reported or shared errors with other health care professionals because of the fear of malpractice lawsuits, public embarrassment, and loss of credibility. However, health care professionals believe their number one priority is the safety of the patient. To improve patient safety is to participate in a standardized medication error reporting system in which health care professionals can anonymously report all types of errors including potential errors that are caught before the patient received erroneous care or medication. By reporting all types of errors, other health care professionals can learn from the mistakes or potential mistakes of colleagues and prevent similar types of errors from occurring in the future.

Another benefit of reporting errors is to identify trends. For example, a health care facility may be able to identify trends in a number of issues such as a particular time frame when errors are noted to occur. These errors could be caused by staffing problems, increases in employee work load, system problems, and so on. Once these problems or issues are identified, providers and management can use this information to make changes or improve the current system, or use this information to educate and make other health care workers aware of the potential, as well as actual, medication errors that occur at their work place.

All health care workers can be educated about reporting medication errors and made aware that reporting a medication error is not necessarily going to result in a legal investigation in which the person in the potential or actual error could lose their jobs.<sup>5</sup> The purpose of implementing a standardized anonymous error reporting system is to create a non-punitive system where health care professionals can freely report and share their experiences regarding medication errors.

### Earlier Reporting Systems

For years, health care professionals have been able to report medication errors and adverse drug reactions through programs established by organizations or agencies such as the Food and Drug Administration (FDA), United States Pharmacopeia (USP), and various manufacturers.<sup>6</sup> MedWatch system established by the FDA for physicians and other health care workers to report adverse drug reactions (ADRs). Medication Error Reporting Program (MERP) is a system designed by the USP for health care professionals to report actual as well as potential near-miss errors.<sup>7</sup> One negative aspect of these programs is that they do not allow sharing or viewing information submitted by other health care professionals.

### MedMARx

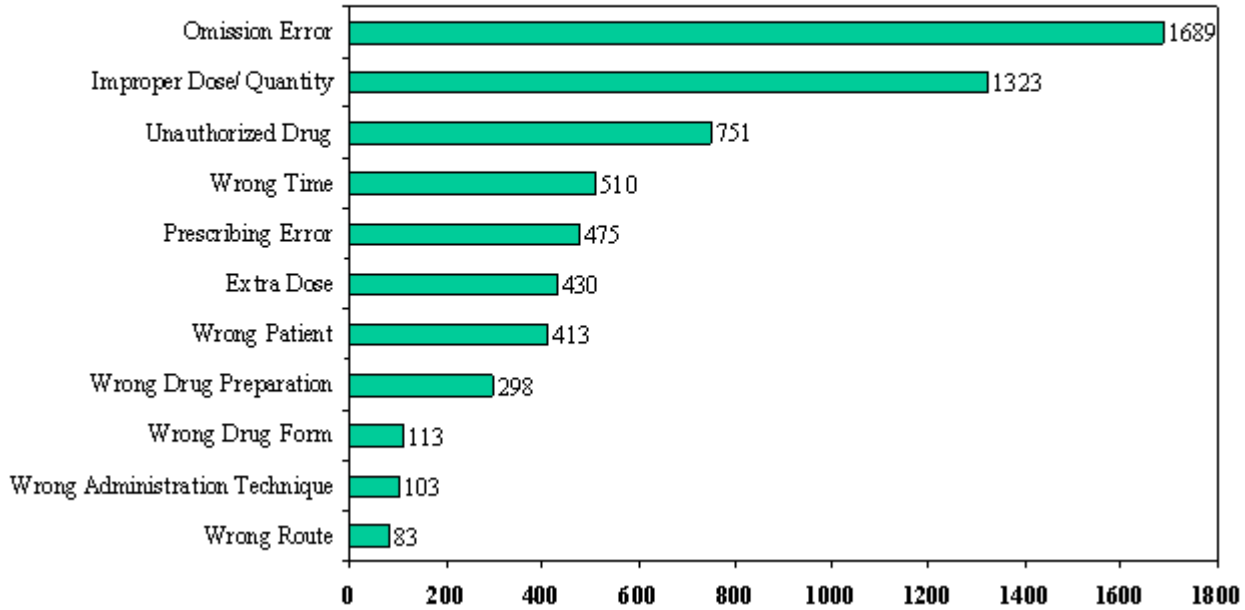
In 1998, the USP introduced MedMARx to the health care industry. MedMARx is a national, standardized, internet-based medication-error-reporting program administered by the USP to address the increased number of medication errors. This program allows participating hospitals to submit actual, near miss, and potential errors and permits hospitals and personnel who enter information to remain anonymous. It also permits staff to view and compare data from other hospitals in order to benchmark performance.

MedMARx uses a severity index scale that categorizes error outcome based on the criteria established by the National Coordinating Counsel for Medication Error Reporting and Prevention (NCC MERP). The categories range in event severity from the letter A to the letter I. Category A is described as an error that prevented an error to occur, (for example two completely different drugs placed next to each other on the label) and category I is described as an error resulting in death (Figure 1).

Error Outcome Category	
Error Category	Result of Error
No Error	
Category A	Circumstances or events that have the capacity to cause error
<b>Error, No Harm</b>	
Category B	An error occurred but did not reach the patient
Category C	An error occurred that reached the patient but did not cause patient harm
Category D	An error occurred that resulted in the need for increased monitoring but no patient harm
<b>Error, Harm</b>	
Category E	An error occurred that resulted in the need for treatment or intervention and caused temporary patient harm
Category F	An error occurred that resulted in initial or prolonged hospitalization and caused temporary patient harm
Category G	An error occurred that resulted in permanent harm
Category H	An error occurred that resulted in near-death event from which the patient recovered
<b>Error, Death</b>	
Category I	An error occurred that resulted in patient death

Figure 1

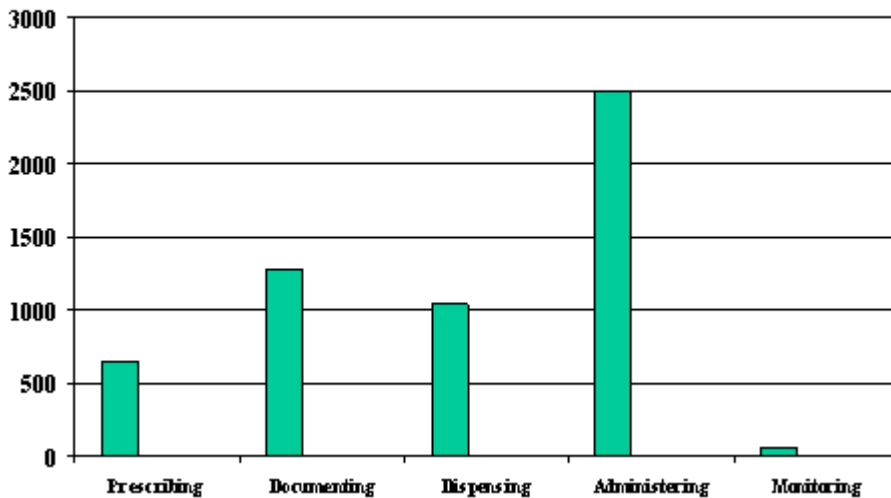
## Types of Errors



**Figure 2**

This program captures data such as the type of error (Figure 2), the point in the medication use which the error originated (Figure 3), the cause of error (Figure 4), the situation or factors that led to error (Figure 5), the level of staff involved in the error, and the error location (whether in-patient error, out-patient medication error, or a particular ward or clinic within the hospital). Other variables that can be tracked and trended include look-alike brand and generic drug names, sound-alike drug names, look-alike packaging, and computer entry/transcription error.

### Where in the Medication Use Process Errors Originate



**Figure 3**

### Top 10 Reported Causes of Errors

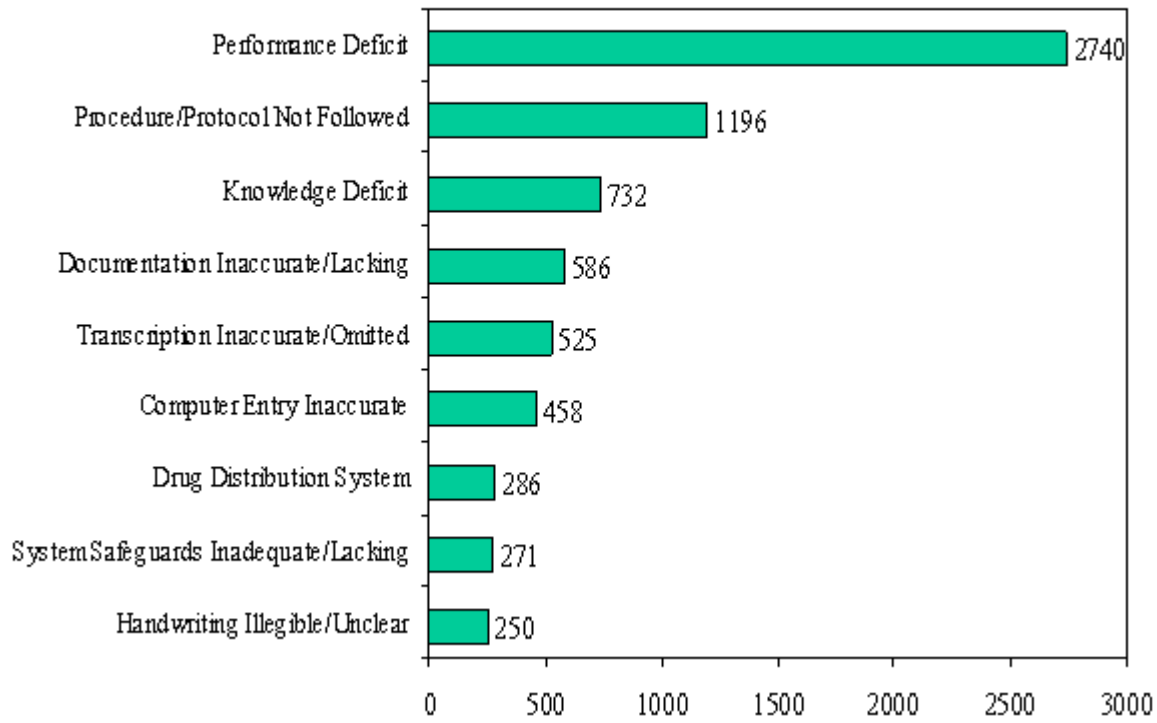


Figure 4

### Contributing Factors

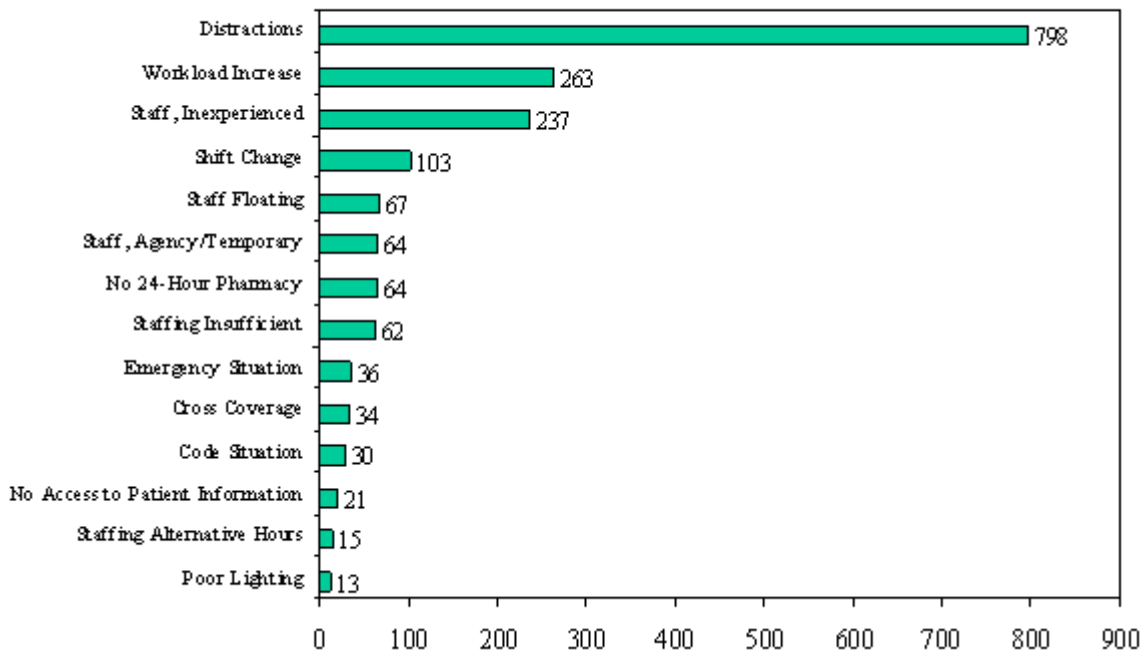


Figure 5

MedMARxÒ also captures specific medication product information, patient demographics such as gender, and specific medical interventions that occurred as a direct result of the error. Reporting name, facility name and any other identifying information is strictly prohibited and is necessary to ensure patient and facility anonymity.

### **Accessible Data**

MedMARxÒ allows users to access numerous graphs and charts to view the data allowing for an aggregate review and analysis. Data can be viewed based on any number of variables including type of error, the location within a hospital, the types of errors at all the locations within the facility, the time of day that errors occur, the medication(s) involved, and the level of staff involved. MedMARxÒ includes a unique feature that allows the user to "drill down" from the graph on screen to the list of errors used to compile the graph. The user can then select an error from the spreadsheet error list and view a detailed error report. This program collects only relevant information pertaining to the adverse event without listing patient or provider names, allowing users to focus on and examine process and system issues.

One distinct advantage of MedMARxÒ is that it allows health care facilities to use information from the MedMARxÒ database to proactively review their current processes, systems, procedures, and policies by viewing dangerous errors that have occurred at other facilities. It can be done immediately after entering any error information from their own health care organizations. Facilities can also use the program to view corrective actions taken at other facilities and proactively implement best practices in order to minimize the likelihood of a similar event occurring in their own organization.

### **Initial Data**

The USP released its first data collection summary of all hospitals subscribing to MedMARxÒ from 1999. This aggregate review summary provided information about the type of error, cause of error, staff involved, as well as many other variables. According to the summary, 97% of the errors reported do not cause harm to the patient. It also indicated that the most common type of error in hospitals was followed by improper dose or quantity, and then unauthorized drug. According to the summary, the most frequently reported product associated with a medication error was warfarin, followed by insulin. Anecdotal data indicates that other facilities have successfully used this program and have positive attitudes about this program. According to an individual at one facility, this system has brought about a change to reporting errors and to the overall safety of the patient.<sup>9</sup>

### **DoD Pilots MedMARxÒ**

In December 2000, the Department of Defense initiated a pilot program utilizing MedMARxÒ in order to standardize medication error reporting across the Military Health System (MHS). Currently there are approximately 50 participating sites. Information will be collected and analyzed by the DoD Patient Center at the Armed Forces Institute of Pathology to determine the benefits of such a program. It is anticipated that this national database will raise standards for reporting and preventing medication errors that ultimately will protect patients from harm within the DoD and throughout health care facilities in the country.

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## **Liability Risks Associated with Trocar Selection During Laparoscopy**

*By Brad L. Hilaman, M.D., J.D.\**

Over the last 15 to 20 years, laparoscopy has evolved from a diagnostic procedure to a therapeutic procedure with an ever-expanding role in disease management. As gynecologic surgeons increased the frequency of these procedures due to advances in technology, laparoscopy also gained popularity within the general and urologic surgical specialties, as well. During this growth phase, laparoscopic-related complications were reported with increased frequency. Such complications include general-anesthesia-related causes as the number of complications,<sup>1</sup> along with injuries to the vascular system, bladder, and bowel. These injuries were one time widely ascribed as an indirect injury due to the use of monopolar current, are now more commonly ascribed as direct trauma caused by the insertion of the insufflation needle or primary or secondary trocars.<sup>2</sup> As indications for operative laparoscopy continue to expand, medical liability risks from injuries continue to increase. Physicians should recognize that laparoscopy carries an inherent risk of injury to vessels and viscera and that the selection of method of entry into the abdomen is a potential contributor to medical liability.

Most complications during laparoscopy occur during the surgeon's first 100 cases.<sup>3</sup> Experience with placement of the insufflating needle and trocar, especially the first trocar, is related to injury frequency, and close supervision during training is absolutely necessary to help avoid patient injury. Perforation of vessels and viscera occurs less frequently with the insertion of the second and subsequent trocars.<sup>4</sup> Frequency of organ injury, associated with entry into the abdomen, is also related to body habitus. In thin patients and children, the major vessels may lie at a distance of less than 1 centimeter to a few centimeters below the skin of the umbilicus.<sup>5, 6, 7</sup> The operating surgeon must continually be aware that anatomic variations based upon body habitus lead to increased risk of injury.

It is important to note that trocar type has an effect on the rate of injury. Logically, then, selection of trocar type and method of initial entry will also have an effect on malpractice litigation outcomes. This review is designed to analyze the ramifications of trocar selection, method of entry (open versus closed), and the comparative medical-legal risks to the physician.

### **Medical Analysis**

Injuries that occur at the initiation of laparoscopy can be best categorized into two types: damage to vessels and damage to visceral organs, i.e., bowel or bladder. Vascular injuries have been reported to occur at a rate of 0.11%<sup>8</sup> to 0.25% in an analysis of 77,604 cases.<sup>9</sup> Injuries oc

more frequently as a result of the placement of the insufflating needle than from primary trocar placement. A review of the literature in 1995 by one researcher identified 20 reported major vascular injuries, 12 of which were caused by the insufflation needle.<sup>10</sup> Another article reported a total of 7 vascular injuries in 5 patients. Three of the injuries were from the insufflation needle insertion.<sup>11</sup> In a Canadian questionnaire, responders noted 109 injuries from the insufflation needle, 104 primary trocar injuries, and 61 secondary trocar injuries.<sup>12</sup> In a 1996 report of 103 laparoscopies, 83% of vascular injuries, 75% of bowel injuries, and 50% of local hemorrhage were caused by the primary trocar insertion.<sup>13</sup>

A literature review of bowel injuries reported a rate of injury to the bowel of 0.07% to 0.75%, with the author's rate quoted as 0.2% in a series of 4672 laparoscopic cases.<sup>14</sup> One injury was caused by the insertion of the initial trocar into the transverse colon. A second injury to the jejunum was the result of the insertion of the Veress needle. The remaining bowel injuries were either a result of electrocautery, blunt injury, or sharp injury to the bowel by the intra-abdominal instrument during the manipulation.

Because of the nature of these injuries, manufacturers worked to develop disposable trocar systems that would increase the safety of insertion of the primary trocar. Initially, trocar systems were non-disposable and had sharp pyramidal cutting edges. The sharper the edge, the less force is required for insertion. Conical trocars tend to cause less wound bleeding because they are blunt cutting. Some believe that non-cutting trocars are superior because of reduced wound complications,<sup>15</sup> but there is no apparent improvement in damage to either deep vessels or viscera with the conical trocar and this may be related to the additional force required to insert conical trocars. The additional force needed for penetration allows for less control of the entry into the abdomen when the fascial layer is suddenly penetrated. Injuries occurred twice as often with conical trocar insertion as with blunt trocar insertion.<sup>16</sup>

### **Shielded Trocars**

The development of disposable devices enabled manufacturers to provide a fresh surgical pyramidal blade with the addition of a safety shield. While shielded trocar systems vary in design, all have a spring-loaded retractable shield that covers the cutting tip of the trocar. The shields are either retracted prior to placement of the trocar in the wound or automatically retract during the placement. Once the sharp tip of the trocar penetrates the abdominal wall and enters the abdominal cavity, the spring-loaded safety shield automatically deploys, covering the cutting tip and locking in place. Theoretically, this prevents or decreases the incidence of damage to bowel and the major vessels. Injuries can still occur, however, if the trocar is not used properly, there is a malfunction of the safety shield, or with the presence of bowel adhesions to the anterior abdominal wall. Insertion of the primary trocar remains a blind procedure. In one study of vascular and visceral injuries, 10 involved safety shield trocars and 16 involved non-safety shield trocars. Two deaths occurred when shielded trocars were used.<sup>17</sup>

Many hospital facilities and surgeons have switched to shielded trocars, recognizing the decreased potential for injury with these systems. A recent survey<sup>18</sup> found that more than one-third of responding hospitals use shielded trocars exclusively, and three-fourths use them in at least half of their cases. Additionally, the 60 responding hospitals from 29 states reported that 69% of their surgeons never use a non-shielded sharp trocar for primary insertion.

### **Optical Trocars**

Most recently, optical trocar systems have been introduced. These systems allow for placement of the laparoscope in the trocar during the insertion, enabling the operating surgeon to continuously visualize the layers of the abdominal wall throughout the insertion process. The system marketed by U. S. Surgical has a spring-loaded blade that is activated by a trigger controlled by the surgeon. A single squeeze of the trigger releases the steel knife blade for a rapid cutting of visualized tissue. The blade immediately retracts into the blunt tip, ready for the next cut. Movement or dissection within the wound when the trigger is released is by a blunt translucent tip. The trigger may be activated as many times as is necessary to enter the abdomen.

Ethicon Endo-Surgery, Inc. markets a second optical trocar system. This trocar has no blade and allows for abdominal entry using a conical tip with plastic tabs that dissect the tissue as pressure is applied to the trocar during insertion. A slight twisting motion of the trocar accompanies insertion. This motion separates the layers rather than cutting them, and the passage through each layer of the abdominal wall, as well as the entry into the abdominal cavity, is continuously visualized through the clear plastic tip.

### **Radical Expanding Dilation System and Open Technique**

Additional trocar systems have been developed to decrease wound complications and the risk of injury. A radially expanding dilation system marketed by Innerdyne has been designed to avoid the blind trocar insertion by allowing for placement of a specially designed insufflation needle. A blunt dilator is inserted which dilates the wound, thus avoiding the insertion of the conventional trocar. This system was evaluated in a comparative study<sup>19</sup> using an animal model, and the authors demonstrated a 50% smaller wound and less wound bleeding.

The open laparoscopic technique<sup>20</sup> claims to minimize the risk of bowel and vascular injury. However, serious bowel and vascular injuries have been reported with the open technique as well.<sup>21, 22</sup> These injuries most likely occur during the dissection of the abdominal wall in the subumbilical incision where visualization of the layers of the abdominal wall as they are being cut by a scalpel is often limited. Further visualization of vessels and bowel is limited when the surgeon sharply enters the peritoneal cavity and prior abdominal adhesions increase the likelihood of injury, even with the open technique. One of the biggest drawbacks to the open laparoscopic technique is the additional time required for the dissection and placement of the trocar and the frequent difficulty encountered in maintaining the pneumoperitoneum, as well as the impaired visualization in the wound.

### **Legal Analysis**

Initial entry into the abdominal cavity during laparoscopic procedures is inherently dangerous. Although injuries have been reported with the insertion of secondary trocars, they are generally placed under direct visualization thus providing for less risk of visceral or vessel injury. It seems obvious that it is imperative to select an entry technique and trocar that are the least likely to cause injury. The surgeon must consider patient size and any prior surgical procedures, as well as trocar design, when the initial laparoscopic entry is selected. One journal reported 272 claims for laparoscopic cholecystectomies between 1993 and 1998.<sup>23</sup> Eighty-five percent (232) of the claims were due to perforations, lacerations, or blood vessel injuries. The Physician Insurance Association of America (PIAA) believes these injuries resulted from trocar insertion. One hundred fifty of these claims were settled in 1994 at an average award of \$150,953. By 1998, the average settlement was \$269,920.<sup>24</sup>

Several laparoscopic injury cases have been reported as appellate court decisions. In one case, injuries to the urinary bladder were sustained during a sterilization procedure. The trial court awarded a total of \$80,000 for the injury alleged to have been caused by the physician's negligent placement of a lower trocar. On appeal, the court held that the plaintiff needed to prove the physician's selection or placement of the trocar was negligent and caused the injury.

In *Diehl v. Koffer*,<sup>26</sup> plaintiff's malpractice action was based on injury sustained during laparoscopic cholecystectomy. During insertion of the initial trocar, damage was done to mesentery, duodenum, and aorta. A profound hypotensive event occurred, the laparoscopic surgical procedure was aborted, and a vascular repair was completed. The court held that the injury in question and the means by which it occurred were "peculiarly in the province of expert opinion."<sup>27</sup> The fact that the injury occurred was not in and of itself proof of the surgeon's negligence.

### **Shielded Trocars**

In *Bowen v. DeFranco*<sup>28</sup> a mesenteric vein and the common iliac vessel were lacerated during placement of the initial shielded trocar. Exploratory surgery and a vascular repair were necessary. The trial court dismissed the case on summary judgment and the plaintiff appealed. Specifically, the plaintiff alleged that the physician failed to properly operate the shielded trocar because he did not maintain the required amount of pressure on the trocar handle during insertion. Testimony at trial indicated that Dr. DeFranco appeared to be having problems operating the trocar during the procedure. In subsequent testimony by the manufacturer's sales representative, however, the trocar was confirmed to be operating properly. Dr. DeFranco claimed that a defect in the trocar was responsible for the injury. The plaintiff's expert opined that if the instrument had been worked properly, the only cause of a laceration would be the manner in which pressure was applied to the handle of the trocar by the operating surgeon during insertion. The case was remanded to a lower court for a trial on the merits.

Use of shielded trocars is not without the risk of injury; they must be used with sufficient skill and training to assure correct operation. Dense anterior abdominal wall bowel adhesions increase the risk that the shield will not deploy before injury occurs. Although this system may not be foolproof, it is clearly superior to no shield at all.

### **Radially Expanding Dilation**

While the radially expanding dilation system avoids trocar injuries by allowing placement of an expandable sheath after the placement of the insufflation needle, many visceral and vascular injuries have been attributed to the blind insertion of the insufflation needle.<sup>29</sup> This system will avoid those injuries, but since insufflation needle injuries are of a smaller diameter, hemorrhage is often less severe and the repair is easier unless full dilatation has occurred.

### **Optical Trocars**

The availability of optical trocar systems has allowed the operating surgeon to visualize the tissue layers of the abdominal wall as they are penetrated. Vessels coursing through the abdominal wall can be avoided once visualized, and the peritoneal layer can be easily recognized once the pneumoperitoneum is established prior to insertion of the trocar. With experience, the peritoneal layer can also be recognized without prior insufflation. Since use of the insufflation needle carries the same recognized risks associated with each use, an increasing number of physicians are not insufflating

the abdomen prior to insertion of the optical trocar. This is similar to the proposed modified technique utilizing the optical trocar system.<sup>30</sup> The combination avoids the potential for damage that can occur with use of the Veress needle or during the open (Hasson) technique.

Another proposed technique combines a subcutaneous abdominal wall retraction system with the optical trocar.<sup>31</sup> This is a gasless laparoscopy, avoiding the use of both the Veress needle and the sharp trocars.

## Conclusion

Plaintiff's attorney could argue credibly that injury caused by the surgeon using sharp trocars at initial entry is not defensible, for a sharp trocar remains inherently dangerous. Today, there are safer shielded trocars, optical trocars, and gasless systems available. To be found medically liable for an injury in a malpractice case, the physician defendant would be evaluated based on the standard of care within the community. In order to remain abreast of such a standard, physicians should be aware that changes in technology require thoughtful individual evaluation and that selection of a trocar system cannot always be based solely on personal preference. The physician must take into account the inherent risk or safety associated with the use of his or her selected trocar.

A physician is required to use that instrumentation which the reasonable physician in the same similar circumstances would have selected. Each physician should further evaluate the comparative safety of the shielded systems and the newer optical trocar systems and be prepared to defend his or her selection of laparoscopic entry technique in an educated and thoughtful fashion. The physician's comfort and experience with each trocar system, the patient's pre-existing history, the trocar design, and the standard of care within the community in trocar selection must all be carefully considered.



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## **Operation Noble Eagle:**

### **AFIP Responds to September 11<sup>th</sup>**

#### **Pentagon Attack**

*By Christopher C. Kelly*

*A multi-disciplinary team of more than 50 forensic specialists, scientists and support personnel from the Armed Forces Institute of Pathology (AFIP) played a major role in one of the most comprehensive forensic investigations in United States history following the September 11, 2001 terrorist attack at the Pentagon in Virginia, just outside Washington, DC.*

Code-named "Operation Noble Eagle," AFIP's team of forensic pathologists, odontologists, a forensic anthropologist, DNA experts, investigators and support personnel worked for over two weeks at the Dover Air Force Base Port Mortuary at Dover, Delaware to identify the 188 victims of the attack. "Our staff represented every branch of the service," said AFIP Director Glenn N. Wagner, CAPT, MC, USN, who served as senior officer during the operation.

The investigation mobilized AFIP assets in many ways. During the hours immediately following crash of American Airlines Flight 77 into the Pentagon, the acting Armed Forces Medical Examiner, Abubkr Marzouk, Col, USAF, MC, began working with FBI and local Virginia law enforcement officials to create an effective plan for first recovering and then identifying the victims. At the same time, personnel from the Office of the Armed Forces Medical Examiner (OAFME) positioned and staged equipment to begin operations at Dover. Bruce Ensign, LCDR, MC, USN served as AFIP's team leader at the site. "We immediately called in regional medical examiners from as far away as San Diego to participate," he said. A total of 12 forensic pathologists, assisted by two AFIP staff pathologists, headed the OAFME investigation team.

Also arriving at Dover during those early critical hours were two other key AFIP groups: forensic scientists from OAFME's Armed Forces DNA Identification Laboratory (AFDIL) and oral pathologists from the Department of Oral and Maxillofacial Pathology. AFDIL scientists ensured

that data systems and records were available to make DNA identifications, while the oral pathology group created a triage area to conduct dental identifications. Contacts were also made with family services personnel in each branch of the military to obtain antemortem information as reference material. Mortuary operations were fully underway by the evening of September 13, just two days after the attack.

AFIP utilized a well-defined and tested system for conducting the identifications of the Pentagon attack victims. When remains arrived at the morgue, a scanning device searched for the presence of unexploded ordinance or metallic foreign bodies. A computerized tracking system then assigned a number to each victim for efficient tracking. FBI experts collected trace evidence to search for chemicals from explosive devices and conducted fingerprint identifications. Forensic dentistry experts from the Department of Oral and Maxillofacial Pathology then performed dental charting and comparison with antemortem dental records. Full-body radiographs documented skeletal fractures and assisted in the identification process, followed by autopsy inspection.

At autopsy, forensic pathologists determined the cause and manner of death, aided by forensic anthropologist Dr. William C. Rodriguez to determine the race, sex and stature of victims for presumptive identification when necessary. A board-certified epidemiologist managed the tracking system for data collected during the autopsy process. Tissue samples were collected for DNA identification and further toxicologic studies. Forensic photographers -- essential to any forensic investigation -- documented injuries and personal effects. Finally, mortuary specialists embalmed, dressed and casketed remains prior to release to next-of-kin.

For eight days a full complement of AFIP forensic specialists worked twelve-hour shifts to complete the operation. "This is the largest mass fatality we've dealt with in recent years," Ensign said. "We have modalities today that we didn't have before. Our investigation was much more technology-intensive."

Ensign noted that the entire team worked well together. "Because of the combined effort of all three services and the FBI we were very pleased with the speed of the identification process. Essential records and references were submitted to us in a timely way." Logistical help from AF also played an important role. "We had tremendous logistical issues obtaining equipment, especially with additional demands in New York City and Somerset County, Pennsylvania," he said. "Fortunately our logistical support was terrific in helping us get material in."

Others also played essential roles. Histotechnicians from the Department of Scientific Laboratories served as autopsy technicians assisting pathologists with the remains, while special agents assigned by the various services helped in the investigation. "It was a terrific team effort," Ensign said.

According to Rodriguez, "This was the largest mass fatality we've seen in years, and it required hundreds of decisions to be made quickly and accurately. But our biggest concern was always the families. We worked hard to get the job done and return the victims to their loved ones."

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