The Challenge Of Changing Roles And Improving Surgical Care Now: Crew Resource Management Approach

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ABSTRACT

Many surgeons are also pilots; the two activities demand similar skill sets. Surgeons have developed an interest in aviation models for managing risk and reducing adverse events, such as Crew Resource Management (CRM) Training. This article provides seven suggestions from aviators that might be adopted by surgeons in an effort to improve surgical care and mitigate patient harm. Each suggestion is offered based upon value added to aviation, with an acknowledgement that the suggestion may be more or less applicable in surgery. The suggestions for dealing with the changing roles for surgeons are: CRM type training to improve teamwork should be required for hospital credentialing, surgeons should brief the OR team before an operation, surgeons should write standards specific to their organization, surgeons should recognize fatigue and age as factors in performance, surgeons should have “check-rides” as a part of the credentialing process, surgeons should abandon the Mortality and Morbidity Conference in favor of a data collection system that effectively examines adverse events for root causes of error, and all members of the surgical team should be subject to mandatory, random drug testing.

Introduction

The pressures forcing change in surgical practice are bewildering. Rising malpractice premiums, unrealistic patient expectations, unsupported increases in healthcare costs, lifestyle demands of younger surgeons, earlier retirement age of mature surgeons, fragmentation, and specialization, all threaten the current definition of surgical practice more than at any other time in the past 3 decades. But perhaps the most compelling force for change is the Institute of Medicine’s (IOM) Report (www.iom.edu) on patient safety, To Err Is Human: Building a Safer Health System. 1 This well-publicized study called for immediate actions to reduce the number of deaths in the United States resulting from medical mistakes. The report identified a variety of factors contributing to America’s “epidemic of medical mistakes,” but concluded that the majority of mistakes are not due to provider recklessness, but rather, mistakes are the result of faulty systems, processes, and conditions. Patients, physicians, administrators, and government agencies are demanding change to address safety issues. In spite of the IOM’s report, patient safety has not improved. Health-Grades, a healthcare ratings, information, and advisory company (www.healthgrades.com) recently (April 2006) released the Third Annual Patient Safety in American Hospitals Study. 2 The report states that the number of medical errors leading to “patient safety incidents” rose to 1.24 million between 2002 and 2004, compared to 1.14 million over the previous 3-year period.

In the absence of effective action to address the medical mistakes problem, private industry has become more proactive. For example, the Leapfrog Group is a coalition of more than 150 public and private sector healthcare purchasers working to improve the quality of healthcare (www.leapfrog-group.org). The Leapfrog Group for patient safety plans to effect change by rewarding higher standards in patient care. The group’s initial efforts will promote computer physician order entry, evidence based hospital referral and intensive care unit physician staffing. 3

As surgeons struggle to adopt effective changes in our systems and processes, many look to a similar effort that began in the aviation world 3 decades ago. The American College of Surgeons has sponsored a postgraduate course at the Fall Clinical Congress for the past 3 years on Crew (cockpit) Resource Management (CRM). CRM is just one of the methods adopted by aviation to improve flying safety. 4 This essay will look at CRM as well as several processes extant in
general, commercial, and military aviation that have enhanced safety. The central focus of this article will be lessons from aviation that surgeons can adopt now to improve the quality and safety of surgical care.

Background in The Aviation Experience

Flying is very safe. Approximately 11 million airplanes depart on a trip every year in the United States. General aviation owns 96% of all aircraft in this country and about 60% of the flight hours. In 2004, 621 million passengers flew 50 million hours. In that year, there were 1,715 accidents: 556 fatalities in general aviation and 79 in commercial aviation. This compares to 830 fatalities in boating accidents, 854 deaths in railroad accidents and over 42,000 highway deaths! How did aviation become this safe, as it was not always this way?

A Little Aviation History: High-Profile Accidents Started the Change

On March 27, 1977, the weather at the Los Rodeos Airport on Tenerife Island of the Canary Islands created poor visibility on the ground. There was fog, light drizzling rain, and the pilots of a KLM Boeing 747 could see less than a quarter of a mile. The pilot in command (PIC) of the KLM Airliner was a senior officer in charge of training at KLM. As such, he did not fly as much as the other pilots, and yet he felt the pressure to be the ultimate authority. In addition, he had a reputation as a domineering personality characteristic of early aviators: “Keep quiet and watch me!” Through a series of events, the KLM captain took off without clearance while a Pan-Am 747 was still taxiing on the same runway. The ensuing collision, just after the KLM 747 became airborne, killed 583 people including everyone on the KLM airliner. One of the many findings from this accident was the remarkable fact that the first officer had a good understanding of the situation and challenged the captain once, but he could not break through the hierarchy to forcefully convince the pilot in command that he was wrong. This is just one accident that eventually resulted in CRM training to change the aviation culture so that the pilot in command now listens to all crewmembers.

How Pilots Changed the Aviation Culture

Surgery and aviation are not exactly parallel activities, but pilots and surgeons share many similarities. Both engage in hazardous events, both are masters of hand-eye coordination, both are problem solvers and quick decision-makers, and both are responsible for the lives and safety of others. For these reasons, the University of Utah has engaged military instructor pilots (IP) to build a new surgical curriculum. The IPs are designing an aviation-styled training program for surgery residents based upon clearly defined goals and objectives that are concise and measurable. These measurable goals will track educational milestones and proficiency, changing the residency from a time-based apprenticeship to an experience-based, curriculum-driven educational program. In addition to making the residency more efficient in the world of work-hour restrictions, this aviation-style curriculum will create surgical practitioners who are grounded in a systems-approach to surgery, rather than the supreme, captain-of-the-ship approach that has been produced and fostered in the past.

The IP who are creating this new curriculum, have observed surgical care in the operating room as well as the wards and conferences. Based on these observations, pilots have the following suggestions when asked, What can surgeons do now to improve performance and enhance patient safety? These suggestions are offered purely as concepts that have been embraced by the aviation world with little attention paid to the likelihood that the surgical world will be as eager to change.

Suggestion 1: Require Completion of Communication Skills Training (CRM) For Hospital Credentialing

In the past, commercial airline captains enjoyed the same status afforded to operating surgeons today: they operated autonomously, their procedures were not standardized, their subordinates did not know what to expect from one flight to the next, and copilots took on a “go-with-the-flow” mentality and were not assertive. In short, effective communication among the airplane crew was ineffective. As a result of this aviation culture, airline captains did not use group decision-making. All communication was unidirectional, from the top down. Subordinate suggestions were met with hostility. Captains managed resources ineffectively and often suffered from poor interpersonal diplomacy. As a result, 70% of flight-related errors were traced to poor communication. In those days, two rules governed behavior: Rule no. 1: “The captain is always right.” And, Rule no. 2 was: “See Rule no. 1.”

Shortly after the Tenerife disaster, several incidents occurred in one airline. A crew took off on the wrong runway, another caused an inadvertent, complete engine shutdown, another landed at the wrong airport, and a takeoff with flaps up caused a number of fatalities. As the number of high-profile aviation incidents and accidents accumulated, aviation leadership decided to address specific attitudes that they thought were the root cause of most accidents. Training to change behaviors and improve performance of the cockpit crew began as CRM. CRM changed aviation by empowering all team members to promote safety and increase overall team performance. In a 2001 survey, 91% of Delta Airlines pilots felt that CRM improved their flight performance, and 85% believed CRM will improve flight safety. CRM improves aircrew cohesiveness and morale, creating effective teamwork. CRM training can improve teamwork and communication in the OR, and it can and should be more widely adopted.

The level of teamwork in the operating room, as perceived by attending surgeons, is markedly different from that perceived by other OR staff. Seventy-three percent of surgical residents and 64% of attending surgeons report high levels of
Before an Operation

Suggestion 2: Brief the Team

Makary and used at Johns Hopkins Hospital.10 The study surveys surgeons, anesthesiologists and nurses regarding their perceptions of the quality of teamwork in the OR. The findings are the same as other studies in aviation and in surgery: the surgeons (airline captains) think that teamwork is great; the nurses perceive teamwork as poor. Hopkins recommends briefings and debriefings in the OR to enhance teamwork, improve attitudes and facilitate communication. This recommendation is based on positive results in the airline industry. The goal of an OR briefing is to create a culture in which any person in the OR feels comfortable enough with the surgeon to bring up any issue that might protect and foster patient safety. The second goal is to create a positive environment in which good teamwork leads to job satisfaction.

The first suggestion from the aviation world of processes to improve patient safety that can be adopted immediately by surgeons is mandatory, annual CRM training to improve communication in the OR.

**Suggestion 2: Brief the Team Before an Operation**

Briefing the team is the easiest part of CRM to adopt. The best example of flight briefing and debriefing is in the military fighter pilot world. Fighter pilots are perhaps the surgeons of the aviation world: they manage risk adroitly, often in a single-seat airplane that goes very fast! Military training missions usually last about an hour; they are preceded by a pre-flight briefing that can last 2 hours and a postflight debriefing that can be even longer. Pre-event briefings in surgery, either the OR or the office, cannot take an hour, but they don’t need to be long to be effective. A preoperative briefing is not the same as an academic session. The objective should be for the surgical team to get to the point that they share, a “mental model” of what is going to happen if all goes well: Who is responsible for doing what to whom during the session. In addition, time should be taken to cover likely errors or complications. The surgeon needs to set the tone in the briefing. The brief does not need to address every unexpected possible occurrence, just the most likely and the most serious ones. A few minutes to define the roles, responsibilities and the game plans for unexpected occurrences are all that is required. This not only gets the team ready for contingencies, but also prepares them to look for and avoid common errors. In all briefings, the common or likely errors should be part of this contingency discussion. In flight training, these common execution errors are defined in previous debriefings and are well-known as the errors are carefully defined and recorded for each individual, each organization and each event. Common errors can lead to standards designed to address frequent errors, but standards in flying operations do more than address common errors; standards are presented as a separate suggestion.

Surgeons can do this now! Surgeons should arrive in the OR earlier than the patient. Surgeons should discuss the patient and the patient’s history with the anesthesiologist as a colleague; this is a time for definition of contingencies and a cross-check on the patient’s medical condition, ensuring that nothing has been missed. Surgeons should discuss the case with the OR nurses, making sure that everything needed is in the room and not expecting them to guess or read the surgeon’s mind. Surgeons should talk aloud as the case progresses, especially if there is a deviation from the plan, so
everyone knows how to support the process. And the responsible surgeon should be the last one out of the airplane (OR), pushing the patient to the recovery room instead of leaving the closure and emergence from anesthesia to someone else. The public is always appalled to learn that some surgeons are responsible for two patients simultaneously asleep in two different rooms. This practice should end. In any aircraft, there is one pilot-in-command (PIC). The FAA regulations clearly describe the PIC’s responsibilities. Surgical patient safety demands a clear set of standards governing the actions of the surgeon-in-command.

**Suggestion 3: Write Standards For Your Organization**

Standards, in flying operations, are a written collection of techniques that are agreeable to 85% of the flying community. Everyone is familiar with the standards of the squadron and everyone adheres to the standards unless the flight leads briefs otherwise. Standards are distinct from regulations; compliance with a standard is not mandatory. Standards improve communication within the group in that standards address common practices that are often administrative in nature, common to many procedures, or just plain annoying. For instance, if you ask five fighter pilots to define the best way to line up four F-16s on the runway before take-off, you will get five responses, and one response will be, “It depends!” Every squadron member knows the squadron standard for runway lineup. If the flight lead doesn’t like to do it according to the standard, the runway lineup will be briefed as nonstandard and defined. Otherwise, the written standard shortens the brief and the flight lead has to only mention that the lineup is “standard.” A typical book of squadron standards is 20 to 30 pages long and covers all phases of flight operations.

Having a set of surgical standards will take some effort and coordination among surgeons and other staff. The goal is an 85% level of agreement on the part of the surgical organization. The concept of standards gets everyone on the same sheet of music for normal operations. It provides more time in the briefing for emergency discussions and helps avoid misunderstandings about roles and responsibilities. Safety is increased by all members of the team understanding how they fit into the process.

In flying operations, standards are the framework upon which fliers build mission success! Standards reduce opportunities for error and they cut down on “creative solutions” in times of high stress. Standards produce a common mindset among all the participants, resulting in prepared observers who can make a meaningful contribution to the flight (surgical procedure) as it progresses. Standards shorten the brief leaving more time to focus on the variations that can lead to error. Standards are particularly well-suited for emergencies and unexpected occurrences. During these times, everyone knows their role and their responsibilities when the plan changes.

The IOM Patient Safety Report\(^1\) states that “mistakes can be best prevented by designing the health system at all levels to make it safer—to make it harder for people to do something wrong and easier for them to do it right.” Almost every type of error identified by the IOM Report\(^1,2\) is relevant to surgical care and could be addressed by a surgical standard operating procedure. Types of medical errors are listed in Table 1.

The opportunities available to surgeons for standardization are far too numerous to list in this essay. For example, everyone on the surgery team should know the routine for prepping and draping; it should not be different for every surgeon. The use of preoperative prophylactic antibiotics should be standardized; the anesthesiologist should not need to ask each surgeon, “Do you want antibiotics?” The evidence identifies those who benefit from antibiotics; that decision should not be left to the surgeon’s whim.

Surgical teams can use the concept of standards for their organization right now. They can begin with items that are annoying as those will be easy to identify.

**Suggestion 4: Recognize Fatigue and Age as Factors in Surgeon Performance**

Fatigue is a major cause of diminished performance. The ACGME has recognized this with work hours restrictions for surgical residents. However, no such restriction exists for older surgeons, whose resistance to fatigue is far below that of their

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**Table 1. Types of Errors**

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<th><strong>DIAGNOSTIC</strong></th>
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<td>- Error or delay in diagnosis</td>
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<td>- Failure to employ indicated tests</td>
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<td>- Use of outmoded tests or therapy</td>
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<td>- Failure to act on results of monitoring or testing</td>
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<th><strong>TREATMENT</strong></th>
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<td>- Error in the performance of an operation, procedure or test</td>
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<td>- Error in administering the treatment</td>
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<td>- Error in the dose or method of using a drug</td>
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<td>- Avoidable delay in treatment or in responding to an abnormal test</td>
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<td>- Inappropriate (not indicated) care</td>
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<th><strong>PREVENTATIVE</strong></th>
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<tr>
<td>- Failure to provide prophylactic treatment</td>
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<tr>
<td>- Inadequate monitoring or follow-up of treatment</td>
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<th><strong>OTHER</strong></th>
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<tbody>
<tr>
<td>- Failure of communication</td>
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<td>- Equipment failure</td>
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<td>- Other system failure</td>
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Table 2. Summary of Current Hours-of-Service Regulations for Commercial Aviation (14 CFR Part 121; 14 CFR Part 135)

- Pilots flying domestic Part 121 operations may fly up to 30 hours per week, 100 hours per month, and 1,000 hours per year.
- Pilots flying domestic Part 135 operations may fly up to 34 hours per week, 120 hours per month, and 1,200 hours per year.
- If the scheduled flight time is less than 8 hours, the minimum rest period in the 24 hours preceding the scheduled completion of the flight segment is 9 hours. This time may be reduced to 8 hours if the following rest period, to begin no later than 24 hours after the commencement of the reduced rest period, is increased to 10 hours.
- If the scheduled flight time is 8 to 9 hours, the minimum rest period in the 24 hours preceding the scheduled completion of the flight segment is 10 hours. This time may be reduced to 8 hours if the following rest period, to begin no later than 24 hours after the commencement of the reduced rest period, is increased to 11 hours.
- If the scheduled flight time is equal to or greater than 9 hours, the minimum rest period in the 24 hours preceding the scheduled completion of the flight segment is 11 hours. This time may be reduced to 9 hours if the following rest period, to begin no later than 24 hours after the commencement of the reduced rest period, is increased to 12 hours.


The military has a long history of managing fatigue in aircrew. This program arose from clinical research conducted by several agencies, including NASA. The research shows that both chronic and acute fatigue affect physical performance (eye–hand coordination), judgment and decision making more than previously thought. Not only did fatigue greatly decrease performance, but it reduced performance far more than individuals perceived that it did. The tired pilot thought he was doing better than he actually was. In addition, they found that a person who had been awake for 24 hours performed as well, or as poorly as a legally intoxicated person. Air Force accident data show that fatigue costs $54 million in aircraft mishaps each year.

The Federal Aviation Administration limits flying hours by regulation (Table 2). The limits are loosely defined for private pilots, and become progressively more stringent as the flight operates under commercial rules (FAR 61.195 and 135.267). Military pilots manage fatigue with a mandatory twelve hours free of duty before flying and no more than 75 hours in a 30-day period. The Aeronautical Information Manual recognizes both acute and chronic fatigue; pilots are advised to spend a longer time recovering from chronic fatigue.

Private pilots (noncommercial flights) are like surgeons; no one monitors their flight hours until a mishap occurs. Private pilots are required to voluntarily perform a preflight self-check for factors that adversely affect performance. That self-check is easily remembered with the acronym, IM SAFE. Private pilots check for: Illness, Medications, Stress, Alcohol, Fatigue and Emotion. If any of these factors are present, the private pilot is expected by the FAA to cancel the flight.

Surgeons should change the current culture that regards admission of fatigue as a sign of weakness. With all the evidence that fatigue adversely affects performance, surgeons are foolish to continue to act as though they are not subject to the same laws of biology.

Surgeons should not attempt more than a reasonable amount of elective surgery in one continuous schedule; surgeon performance during an elective total hip arthroplasty beginning at 9 p.m. after a full day in the OR is going to be diminished compared to the first arthroplasty of the day.

Surgeons should recognize that age affects resistance to fatigue and that age affects performance. Older pilots have more accidents. This fact, reported in a popular flying magazine, is supported by careful accident data. The Associated Press analyzed 5 years of accident data from the National Transportation Safety Board and the FAA. The data show that pilots over age 60 make up only 15% of all licensed pilots, but they are responsible for 24% of all accidents. Thirty-seven percent of all pilots are over age 50 and they account for 56% of all accidents. Maybe older pilots did more flying than their younger counterparts, which would explain the higher accident rates, but the commercial aviation industry retires airline captains at age 60.

After careful data collection and analysis, surgeons should agree upon reasonable clinical restrictions based on age.

Suggestion 5: Credentialing For Hospital Privileges Should Include Surgical “Check-Rides”

Senior pilots (check airmen) observe and grade airline pilot proficiency every 6 to 12 months. Check-rides can be scheduled or performed without prior notice. Check pilots evaluate compliance with regulatory guidance, standards, briefing skills, and overall performance. Initially, surgeons may resist this concept; placing one’s job in jeopardy voluntarily is not a likely course of action for most of us. In an activity in which lives hang in the balance, pilots and surgeons owe the customers, patients, or passengers in the case of aviation the best performance possible. Surgeons must be willing to set egos aside and focus on the importance of the endeavor. Check-rides could be initiated as nonemergency events. It could be viewed as an opportunity to learn new techniques, polish old ones, and take on improved briefing and execution skills.
Surgical check-rides can be adopted now as part of the continuing credentialing process. If the “check-surgeon” has appropriate qualifications, continuing medical education credit might be granted for participation in such an innovative program that will be driven by quality improvement and patient safety. Insurance companies might favor institutions with a program that documents proficiency in surgeons.

The FAA requires a biennial flight review for all private pilots. Every 2 years, pilots must fly with an instructor pilot and undergo an oral examination. This is a time to brush up on flying techniques, regulations and new developments. This is not a pass–fail, threatening experience, but it is usually fun. Some pilots have a flight review every year.

Surgeons should create a similar surgical “check-ride” now as part of the credentialing process.

**Suggestion 6: Mortality & Morbidity Conferences Should Reflect the Blameless Culture of Aviation Accident Investigations**

Evaluating aircraft accidents for root causes rather than to assign blame made a huge difference in aviation. Aviation investigators get to the real facts, the real decision process and dig to the lessons in all accidents. By encouraging another to be open and honest in a nonretribution environment, pilots have been effective in reducing accidents. The key here is that pilots quit being “private” about their lessons. Pilots began to “talk” to each other and learn from one another’s mistakes and experiences. In fact, this occurs today. If a pilot has an incident and files a report with FAA safety office, they cannot have certificate action taken against them for that incident. The FAA de-identifies the report and publishes the narrative and lessons learned. Pilots all learn and improve decision-making skills and proficiency and, therefore, safety.

The IOM Patient Safety Report recognizes the need for a system, similar to aviation that collects meaningful data from adverse patient events that result in serious harm or death. The IOM recommends a nationwide public mandatory reporting system to find and fix root causes of error rather than expose providers to blame. The medical malpractice system is a serious impediment to any systematic effort to learn from medical mistakes. Surgeons are guarded in their candor for fear of litigation. Aviation’s blameless culture is a good example of a way that the surgical culture can change for the better. In addition to the mandatory reporting system for serious harm and death, the IOM Report encourages all physicians to participate in a voluntary system to report data on less serious events, one that causes little or no harm. This voluntary system would focus on a broader set of errors, exposing weaknesses that can be fixed before serious harm occurs. Surgeons should take the lead in developing such data collection systems that truly expose root causes for error so that these problems can be fixed.

Such a data collection system cannot be adopted now as none exists. However, surgeons can admit now that the current M&M conferences are obsolete. The very best M&M conference is little more than a clinical review for residents and at worst an lesson on avoiding blame. Surgeons should support a national initiative, similar to the National Transportation Safety Board that will collect and use meaningful data from adverse patient events.

**Suggestion 7: Begin Random Drug Testing For All Staff**

Drug testing is the most straightforward step directed solely at patient safety that is available to surgeons now. For obvious reasons, accurate data does to exist, but currently accepted rates for impaired doctors are as high as 15%.18 Even though the current focus of patient safety advocates, including the IOM and the Leapfrog Group, promote the idea that medical mistakes are primarily due to “failure of systems, not from individual carelessness or inadequacy”11 removing impaired members of the surgical team from direct patient care until they can obtain help will have obvious benefits to patient safety. An informed public can now buy physician reports from HealthGrades (www.healthgrades.com) that include disciplinary actions. Random drug testing in the healthcare workplace makes so much sense that little discussion is required. Identification of healthcare workers with a drug problem is not only good for patients, it is good for the impaired provider. This suggestion from the aviation world of processes to improve passenger safety can be adopted immediately. Universal acceptance by surgeons for this initiative will be a great start to winning back the confidence of the public.

**Summary**

Pilots have changed the aviation culture over the past 30 years for the better. Aviation processes have evolved that standardize operating procedures to manage risk. Pilots did not initially embrace these changes with open arms. The suggestions in this essay come from pilots who have a working knowledge of the surgeon’s world. These pilots acknowledge that the changes suggested in this paper may not be so easily adapted into the surgical world.

**References**