

Aviation

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Abstract

Background An increased awareness of the need for safety in medicine in general and in surgery in particular has prompted comparisons between the cockpit and the operating room. These comparisons seem to make sense but tend to be oversimplified.

Discussion Attempts in healthcare to mimic programs that have been credited for the safety of commercial aviation have met with varying results. The risk here is that oversimplified application of an aviation model may result in the abandonment of good ideas in medicine. This paper describes in more depth the differences between medicine and commercial aviation: from the hiring process, through initial operating experience, recurrent training, and the management of emergencies. These programs add up to a cultural difference. Aviation assumes that personnel are subject to mistake making and that systems and culture need to be constructed to catch and mitigate error; medicine is still focused on the perfection of each individual's performance. The implications of these differences are explored.

Keywords Aviation · Healthcare · Safety

Despite an increasing emphasis on safety in healthcare, objective measurement of improvement has been relatively hard to come by. JCAHO data indicate that compliance with such simple tasks such as marking the surgical site and performing a “time out” has actually decreased over the past 4 years.¹ Furthermore, an institution dedicated to safety improvement that launched ambitious crew resource management programs modeled after aviation has reported low compliance rates with these simple tasks after expensive training.² Thus, it appears that, though the airlines have become much safer over the past 50 years, it is unlikely that patching their crew resource management training alone onto surgical practice will make us just as safe. To accomplish the level of safety that is predictably achieved

by high reliability industries like nuclear power and the airlines, we will need to change our culture.

The good news is that cultural change does not require the purchase of expensive equipment or the discovery of a gene. The unfortunate news is that cultural change, especially in a profession as complex as medicine, is difficult to accomplish. Addressing the Royal College of Physicians, safety expert James Reason said, “Aviation is predicated on the assumption that people screw up. You (healthcare professionals) on the other hand, are extensively educated to get it right and so you don't have a culture where you share readily the notion of error. So, it is something of a big sea change.”³

The danger is that our frustration with the lack of improvement in safety areas will lead us to abandon techniques that can work if properly understood and applied. A survey of aviation training methods makes it clear that airlines do much more than crew resource management in an effort to be safe. That they are safe is not in dispute. How do they do it? How did they change the culture from the imperious captain/tyrant to cockpit leader with “confident humility?”

Here are some of the ways that airlines instill cultural mores into their operations. It starts at the beginning with personnel selection. The newly hired pilot is in many ways analogous to a new faculty hire just finishing his or her

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residency. The incoming first officer has at least 2,500 h of flying time and a certain percentage of that is in turbine aircraft as pilot in command. At Southwest Airlines, the new pilot has already obtained a Boeing 737 type rating.

The first noticeable difference is in the hiring methods. Airlines interview prospective pilots in an orderly and scripted manner. They do not have search committees as we know them. Although all pilot applicants must have letters of recommendation, the interview is extremely important. Applicants are asked “about a time when you disagreed with a superior and how did you resolve the conflict?” In the line-oriented interview, applicants are placed in a cardboard cockpit seated next to a captain and in front of a retired captain. A series of problems is provided to the applicant and he or she has 7 min to solve the conundrum. As the clock winds down, those who communicate well with other crew members and accept responsibility as well as input are rated highly. The airlines distinguish between an autocratic “captain of the ship” and a leader. Most surgery departments hire new faculty by letters of recommendation, common training experience or friendships, and an unstructured interview.

Once hired, the new pilot undergoes 8 weeks of training. Issues like the importance of flight operations manual, dress and behavior codes, and practical matters such as how to preflight the airplane, fly the airplane, and manage emergency procedures according to clear company policies are all covered. At the center of this training is the concept of “flow,” the sequence of maneuvers, discussions, checklists, and read backs that mark the conduct of a safe flight. At the conclusion, each new hire must pass a simulator check ride or proficiency check. In medicine, we frequently ask the new surgeon to become credentialed by filling out some paper work, give them an office, office hours, and block time in the operating room. Orientation programs are usually regulatory and not culturally oriented.

Once flying the line, new pilots undergo 25 h of Federal Aviation Administration required initial operating experience. Specially trained check airmen are assigned to the new hires and evaluate them for flying ability, problem solving skills, situational awareness, and crew resource management techniques. In our surgery department, very little mentoring of new faculty has been done traditionally.

Recurrent simulator and ground school training is mandatory every 6 months for captains and every year for first officers. New regulations, checklists, and flight operations are covered extensively during a several day period at full pay. A proficiency check is required prior to return to duty. In surgery, we take a written exam every 10 years that is unlike the type of check ride/knowledge testing that occurs in the airlines. Even with new initiatives for maintenance of competency and skills testing, the various types of surgical practice and subspecialties will require much more elaborate

simulation and “ground school” than is typically done by the airlines. Checklists are used routinely and habitually by airline personnel and sporadically by surgical workers. In the airlines and military, checklists are viewed as another member of the crew. They are living, evolving instruments. Checklists are not “to do” lists, but just what they claim to be: methodical reminders to be sure that important procedures have been successfully carried out. “Challenge and Response” are the critical construction format of aviation checklists. In areas where some surgical teams use checklists, they are home grown and are not consistent from one hospital to another. Rarely are they constructed in a challenge and response format. Frequently a box is to be checked, inviting misuse of the checklist.

A major cultural difference between aviation and medicine is our perseverance about documentation rather than actually doing things safely. Thus, a nurse is frequently typing during the time out rather than insuring that the information is accurate. No pilot is asked to fill out a form proving that she checked the landing gear position prior to landing. The checklist is there to be certain the wheels are down, not documented to be down.

Briefings are central to safe airline flight. Several, not just one, are routinely done prior to, during, and after a flight. There are first flight of the day briefings, pre-start briefings, taxi briefings, pre-takeoff briefing, approach and landing briefings, and post-flight debriefings. These multiple communication events are short, patterned, and expected. In surgery, we have a moment referred to as “timeout.” This word sounds like a break in the action, as if we are unsafe most of the time and take a break to be safe. In aviation, safety is woven into the fabric of flight. Briefings in the pre-op holding area and in the operating room before induction and before incision are critical steps that are not routinely covered by a “timeout.”

Once in the operating room, surgeons are expected to deal with various emergencies by memory, whereas most in-flight emergencies are handled by reference to a “Quick Reference Handbook.” In this book, one finds the appropriate algorithms to follow for engine fire, generator failure, sudden depressurization, etc. Most operating rooms have no handy reference materials to guide surgeons, nurses, technologists, and anesthesia personnel when something unexpected occurs. The treatment for bradycardia, for example, is highly individualized based on staff experience and knowledge.

Airliners are designed to function with some pieces of equipment inoperative. A “Minimum Equipment List” handbook contains the rules for deciding whether a flight can continue or begin with, say, an auxiliary power unit generator malfunctioning. In surgery, most equipment, supply, and environment decisions are left to the discretion of the surgeon, who may never have contemplated the consequences of starting an operation without blood available until an unusual antibody is detected.

Duty hours for airline pilots are 14 h on duty and 8 h of flying per day. Rest periods between duty hours are strictly proscribed. Random drug and alcohol testing is an industry standard. In surgery, with the exception of the 80-h work week for resident staff, no mandatory rest periods or routine screening for performance impairing substances is in effect.⁴ No fault reporting, as described by Dr. Greenberg in the preceding article, is also an important safety tool in aviation. It is administered by NASA, not by the FAA, and has the mechanisms to preserve reporter anonymity. Though many hospitals have reporting systems, most clinicians are unaware of them and infrequently contribute near miss information.

Below 10,000 ft, all airline operations are under “sterile cockpit rules.” No discussion other than that pertinent to the safe conduct of the flight is permitted. Compare this to most operating rooms where irrelevant discussions are frequently entertained even during the most critical portion of the procedure. I know from unhappy personal experience that it is during these times that inadvertent mistakes can be committed, sometimes with disastrous consequences.

Though not exhaustive, this list of differences between aviation and surgery provides some context by which to judge our initial attempts to improve safety. We have a lot more to do than crew resource management. Now is a good time to start. All that is required is will. A safer work environment is not just good for patients; it makes the operating room a calmer place, more fun to work in, more efficient and safer for everybody.⁵

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