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ScienceDirect

British Journal of Oral and Maxillofacial Surgery 57 (2019) 407–411

BRITISH Journal of Oral and Maxillofacial Surgery

www.bjoms.com

Review

Leading article: What has an Airbus A380 Captain got to do with OMFS? Lessons from aviation to improve patient safety

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Accepted 17 February 2019
Available online 14 May 2019

Abstract

The understanding of why air accidents occur and all the factors involved with them has been a strong and constantly evolving driver for improving flight safety. While they are diverse professions, there are many similarities between flying commercial aircraft and surgery, particularly in relation to minimising risk and managing potentially fatal or catastrophic complications. Safety developments in the operating theatre seem to have lagged behind other High Risk Organisations (HROs). A 2018 Quality Care Commission report stated that never events are wholly preventable and expressed the need to learn from other industries. In this article we discuss various transferable lessons and procedures advocated from aviation that could be applied to OMFS in an attempt to improve team culture and safety for our patients.

Keywords: Surgery; aviation; flight safety; human factors; medical error

Introduction

Aviation and medicine are sometimes compared but in reality are diverse professions. Unlike medicine, in aviation a mistake can result in large-scale loss of life. Airlines rarely have technical failures while patients often have multiple diseases and co-morbidities, even before we start operating on them. The 2017 International Air Transport Association (IATA) 2017 Safety Report concluded that commercial air travel is safe with no passenger fatalities on jet aircraft during that year, despite a total of 45 accidents worldwide.[1]

Despite obvious differences between our professions, both deal with risk and uncertainty on a daily basis, and in this regard, aviation is years ahead in understanding and mitigating the human element of error. Much can be learnt from them and other high risk organisations (HROs).[2,3] As surgeons, it is important for us to embrace and apply human factors (HF), ensure we look after ourselves at work,[4] and reduce hierarchy in teams to improve patient safety.[5]

Culture was changed in aviation during the late 1970s following several tragic accidents when it was realised that the technical skills of piloting an aircraft were insufficient to ensure safety and best performance; accidents were occurring for reasons other than inadequate piloting skills. Originally called Cockpit Resource Management and later renamed to Crew Resource Management (CRM), training emerged in aviation to address these non-technical skills. In order to maintain an Airline Transport Pilots Licence (ATPL), aircrews undergo mandatory assessment every 6 months to ensure adequate communication, decision-making, situational awareness, problem-solving and effective team working skills are maintained.

Today, the most senior captain could be disciplined if he/she failed to listen to, or act upon on the most junior co-pilots concerns, irrespective of the seniority or experience

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https://doi.org/10.1016/j.bjoms.2019.02.012

between them. CRM and the tools it provides, has created a strong safety culture together with human error awareness and the need for high reliability.[2]

Lowering the steep hierarchy that exists in some healthcare teams

The steep 'cross cockpit gradient' that existed between captain and co-pilot was well known as a flight safety threat. Sadly, this steep gradient still exists in some healthcare teams.

On day one of employment for a major UK airline, new pilots are met by both management and Union representatives and empowered by both to speak up on the flight deck if they have any safety concerns whatsoever, without fear of retribution. Can we say the same happens routinely in healthcare during new junior doctor induction days, or when they meet their new consultants for the first time? Errors will continue to happen, but failing to learn from recurring mistakes that occur across the NHS on a daily basis is unacceptable for patients who place their trust and lives in our care. Surely we need to look and learn from other HROs and change culture across the heath service and thereby further improve patient safety as has been recommended recently by the 2018 Care Quality Commission report 'opening the door to change?'[6]

The risk of unintentional harm in hospital inpatients is 3-16%[7] and occurs as a result of various factors including organisational complexity, poor communication and team working and the real or perceived inability to be able to challenge those more senior when something does not seem right. While the operating theatre is one of the main environments where patients are most likely to come to harm, these safety issues also occur both in primary and secondary care.

The well-known Kennedy Inquiry of cardiac surgery at the Bristol Royal Infirmary, UK in 2001 found an imbalance of power, resulting in very few healthcare colleagues having significant control with a steep hierarchy between consultants and more junior colleagues.[8] Steep hierarchal gradients can be linked to other damaging issues in the workplace including bullying[9] and has a negative affect on team relationships and the tendency for conflict avoidance.[10] The fear of speaking out is still widespread across healthcare with the Gosport Inquiry serving as just one recent example.[11]

In contrast, just culture in aviation actively encourages employees to share their safety concerns at the earliest opportunity. Historically, airline captains acted autonomously and sometimes used non-standardised procedures, which resulted in co-pilots (first officers) not knowing what to expect from one flight to the next. Suggestions made by subordinates were often met with hostility, which resulted in communication being unidirectional and ineffective, and the co-pilots adopting a submissive attitude.[12] As a consequence, 70% of flight errors have been traced back to poor communication and leadership.[13]

The historical "god" like stance of the Captain had to be challenged for safety to improve. Peer monitoring - a fundamental part of CRM that addresses this issue - could be applied directly to the surgical environment. An example in aviation is where the co-pilot calls 'stable' or 'not stable – go around' at 1000 feet above the ground before landing (Fig. 1). In this situation 'stable' means that the aircraft is in the correct landing configuration, on the profile for the approach and with an acceptable approach speed, while 'not stable - go around' is used to avoid continuing what the co-pilot perceives to be a potentially dangerous landing. The danger has been identified as a possible runway excursion which can be seen in data from IATA Safety Reports.[1] If the call to 'go around' is disregarded, the co-pilot would report the incident and the captain could be disciplined by the airline's senior management.

Fig. 1. On the flight deck the captain can be challenged by the co-pilot without fear which helps to ensure safety at all times particularly during landing.

This practice has already been translated into the theatres at many hospitals where the surgical team all accept input from those around them, or face the consequences of serious unchecked errors being allowed to pass without comment. Each team member, including trainees, should be encouraged to check the action of their peers. If a suspected error is about to occur, a team member should intervene with direct questioning or an offer of explanation. Over time, this cycle of checking becomes habitual and should occur regularly during surgery to break a potential chain of errors.

Junior staff may not feel able to make observations that criticise senior colleagues. For example, a senior surgeon might feel threatened by a bright, young, enthusiastic trainee and block any difference of opinion, which could lead to the 'team' concept failing. As in aviation, an environment conducive to peer monitoring can be fostered by briefings, which facilitate interactive communication, enhance team-

work, and create a non-threatening atmosphere. It is referred to as flattening of the perceived cross-cockpit gradient and by no means undermines the authority of the captain if done properly.[5]

Adopting a blame-free culture in healthcare as in aviation accident investigations

Flight data recording is sophisticated and possible errors are sent electronically to headquarters where they are analysed. If pilots admit to an error by filing a flight safety report (similar to a serious untoward incident requiring investigation, SIRI), then the incident may be viewed more leniently, and lessons can be learned. In one major UK airline the data is de-identified and the pilot's union BALPA (The British Airline Pilots Association) acts as an independent intermediary. By being open and honest in a blame-free environment and by sharing lessons learned from mistakes, pilots have reduced the incidence of accidents.[1] This could be difficult to achieve in surgery as successfully since error reporting has traditionally been associated with secrecy, embarrassment, and the fear of litigation and retribution. Imagine if all procedures were recorded, as both flights and simulator assessments are in aviation. The just and learning culture leap is to use error data not to punish and litigate, but to learn and improve. It is hard to argue with facts and aviation has a strong history in not allowing Air Accident Investigation Board (AAIB) data to be used for procecution nor released to the media for possible sensationalism.[14]

Hopefully the newly formed Hospital Safety Investigation Branch (HSIB) will adopt the same stance.[15] Surgeons might consider developing a data collection system that focuses on a broad set of errors that cause little or no harm, rather than on more serious issues of morbidity and mortality. This method of reporting errors has been shown to be a vital source of information, and would help to expose root causes and to direct educational resources appropriately.[16]

The concept of CRM and thinking ahead to reduce later problems

CRM began to formalise in 1979 when a NASA workshop convened to discuss the role of human error in air crashes.[8] CRM has continued to evolve and it travelled quickly to the UK where the Civil Aviation Authority (CAA) has embraced it. While there are no definitive data to link CRM to reduced error other than looking at the trends of aviation fatalities and accidents, its validity has been accepted by the industry and it is now an integral part of flight training. Several studies have highlighted a similar need for improved teamwork in healthcare and have explored the concept of adopting practices from CRM to improve safety for patients.[17–19]

The programme for CRM in aviation has recently been updated to include Evidence Based Training (EBT) on which pilot's are both recruited and trained. The elements are interpreted by airlines but the principles remain the same. From a practical standpoint, it focuses on educating crews about the limitations of human performance, and how stressors such as fatigue, emergencies, poor communication, and work overload contribute to errors being made. The skill sets used by one major airline based in the UK is shown in Table 1. Mitigating the circumstances in which these human factors occur (by the CRM concept) should result in fewer accidents or errors being made. More importantly crews learn and have core principles with which to deal with the sometimes grey decision-making elements of their job. Threat and Error Management (TEM) is the practise of thinking ahead in order to predict and avoid errors and operational threats, and manage any that occur. An old saying in aviation is 'a superior pilot uses his superior judgement to avoid situations that would require his superior skills.' TEM is not an attempt to eliminate threats and errors but is concerned with the management of them. Unless the number and quantity of the errors are known, understood and reported, the learning to both trap and mitigate are severely impeded and aviation spends a good deal of time and money with it's open reporting culture trying to collect data to spot trends and the potential holes, as in the Swiss Cheese model, that could lead eventually to a serious incident. Can we say the same about healthcare?

Table 1
Pilot Competencies used by a major airline.

Professional Standards
Leadership and Teamwork
Communication
Situation Awareness
Workload Management
Problem solving and Decision Making
Knowledge and Application of Procedures
Manual Flight Control
Automatic Flight Control

CRM associations with healthcare

Unlike commercial aviation, the importance of human factors is not completely entrenched in medical or surgical practice although they have become more accepted in recent years. Understanding the CRM concepts is even more important in surgery as the operating theatre has been cited as the place where adverse effects occur most commonly probably because of the integration of different teams, resources, competencies, and pressures on time.[20] A specific scale that measures the quality of teamwork in the operating theatre has been shown to be reliable and valid, and could be explored further.[21] As in aviation, OMFS departments could easily modify a CRM approach in training to help in areas where human factors contribute to surgical errors before, during, and after operation, and suggestions made by airline pilots could be incorporated.[6]

Briefings always take place before, during, and after flights. They are not delayed, drawn-out affairs but deal quickly with basic factors that could affect the efficiency and safety of equipment, staff, and passengers. A short interactive briefing is always held between the captain and the first officer(s) before a flight while the cabin crew inform themselves specifically about their own responsibilities. The entire team then jointly discuss problems that could become possible factors for error during the flight such as weather, delays, and flight time. They result in the team sharing a mental model of their responsibilities, they allow them to look for common errors and threats that can be avoided, and allow for contingencies to be prepared for. Briefings occur when necessary during the flight, and any elements that went wrong or could have been done better are discussed after landing. The concept of a Post Flight Review is new and has taken some time to bed in. It focuses not on individual performance but what went well and what decisions might be changed next time.

To be effective in the operating theatre environment, the whole surgical team should usually arrive in theatre before the first patient. The operating list should be discussed with the anaesthetist and theatre nurses, and checks should be made that all equipment required is available and working. Talking during an operation as the pilot does during a flight, is part of CRM, which allows the "co-pilot team" (consultant, registrar, SHO, scrub nurse, or anaesthetist) to support the process and deal with possible deviations from the 'flight plan.'[22,23]

It is easy to forget a postoperative debriefing, particularly after a long and tiring operation, but a quick discussion between the team can avoid a repetition of errors and can enhance team-building. Praise given in public, or the consultant thanking the team, goes a long way to secure respect. Perhaps it is worth reflecting on whom you like to work with and why that is?

Don't forget checklists

Checklists are constantly used in aviation as reminders and to ensure that all necessary checks have been completed. One of the authors (MD) remembers going through a phase where pilots thought they were 'too cool' for checklists. However, financial and operational pressures on aviation and continued accidents eventually lead to the acceptance that checklists were a safety net rather than a magnifying glass for incompetence and poor performance. Active participant use and engagement with the WHO surgical safety checklist is routinely used in theatre and significantly reduces surgical complications and deaths.[24] Other checklists could include those for the postoperative management of major cases, and for pre-assessment before specific operations to try to minimise cancellations for preventable causes. They would be particularly useful for junior team members who are largely responsible for repetitive and routine tasks that may otherwise be forgotten. The lists should be referred to constantly no matter how experienced the surgeon or staff. On some

Fig. 2. Checklists are important especially before landing and take off. This Airbus A380 uses electronic tick item on a display screen. Would you want to fly if these had not been completed carefully?

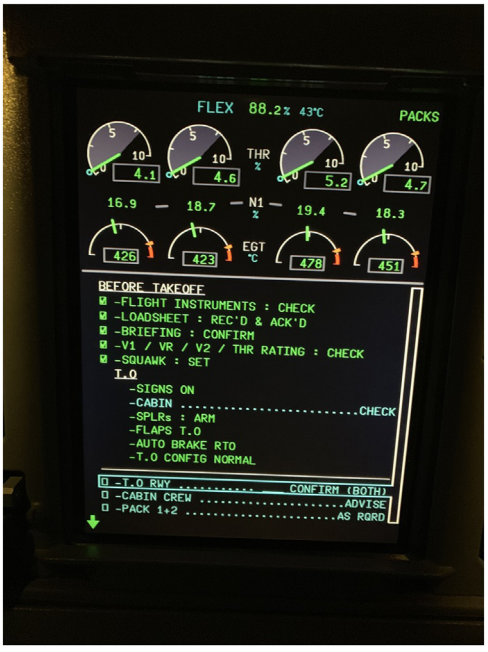

Fig. 3. Electronic checklist screen on the A380 after all four engines have been started and before take off.

modern aircraft such as the Airbus A380 (Fig. 2), checklists have evolved to become electronic tick items on a digital display screen (Fig. 3) rather than a historical printed check list. The obvious benefits to this are that you can see what has been done and what is next. Ticking off on a white board in theatre could be considered.

Conclusions

Some of the issues discussed in this article might be embraced more easily into surgery if like pilots, we shared the fate of any mistake with our patients. To err is human and there will always be mistakes but surely we owe it to those who place their trust in us to reduce risk as much as possible? The execution of both aviation and surgery should have no ego.

Ethics statement/confirmation of patients' permission

Not applicable.

Conflict of interest

We have no conflicts of interest.

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