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EDITORIAL

# Device or target? A paradigm shift in airway management

## *Implications for guidelines, clinical practice and teaching*

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Good judgment comes from experience, and a lot of that comes from bad judgment.
'The mechanic' – Millenium Films – CBS Productions 2011.

As anaesthetists, it has been a part of our 'DNA' for years to believe that proficient and successful airway management is a prerequisite for any major surgical procedure. We have all witnessed descriptions of adventurous tales from our colleagues/predecessors, who were able to carry out major surgical procedures such as total gastrectomy merely using a facemask with manual ventilation for hours. In this perspective, introduction of laryngoscopy and intubation in routine airway management has been perceived as the panacea of all problems and the milestone of the modern anaesthetic era.

It has taken us years as a speciality to become accustomed to and comfortable with safe intubation techniques and appropriate use of muscle relaxants while providing a safer environment for conduct of anaesthesia for a wider range of patients. Although anaesthesiology has expanded its boundaries, new problems and challenges have emerged despite ongoing efforts to raise adequate awareness.

Since the publication of the first airway management guidelines by the American Society of Anesthesiologists (ASA) in 1993,[1] several publications and guidelines have been produced by different scientific societies worldwide in respect of safer airway management.[2] The evaluation and management of airways became a cornerstone of any periprocedural assessment, which is widely reflected in the recent ESA pre-operative evaluation guideline.[3]

On the contrary, despite declining figures, airway-associated adverse events remain one of the primary causes of anaesthesia-related morbidity and mortality.[4–8]

The introduction and dissemination of new airway devices, such as the laryngeal mask airway (LMA), supraglottic devices[9] or more recently videolaryngoscopes have certainly contributed to reductions of airway accidents and complications over the last few decades. Nevertheless, especially during phases other than anaesthetic induction[4,6] and in the emergency setting,[6] patients still risk serious harm or even death. One may even argue that we may merely be facing the tip of the iceberg of airway-related troubles due to lack of reporting.[7]

These data should act as a warning not only for experts and opinion leaders, but for us all: despite the greatest technical evolution ever in this field over the last 10 years, we still have a long road ahead of us (Fig. 1).

The ASA Closed Claims Analysis clearly demonstrated that the introduction of ASA airway management guidelines reduced airway-related deaths or brain damage (from 62 to 35% of claims).[4] This has led most opinion makers to recognise that the main explanation for this success is the creation of guidelines with flowcharts and action cards, while widespread diffusion and implementation remain an ongoing challenge.[6,8]

Airway management-associated morbidity and mortality remain a sad reality for us as a scientific and academic society despite introduction of a plethora of airway tools. Attention from media, relatives and medicolegal cases, such as the Elaine Bromiley case in the United Kingdom,[10] have not only drawn public attention but also forced the scientific community to explore new strategies for coping with such issues.

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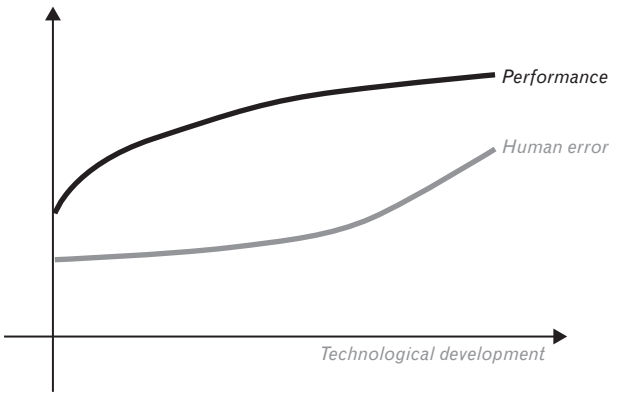
**Fig. 1**




Relationship between technology and human error. Due to growing complexity of technology, the increased requirement for both technical and nontechnical skills results in a parallel increase of human errors.

In this respect, the Royal College of Anaesthetists and the Difficult Airway Society in the United Kingdom promoted an impressive national audit (4th National Audit Project: NAP4),[7] clearly showing that the main causes of airway management accidents were patient characteristics (77% of cases), flawed judgement (59%) and levels of education and training (49%), while availability of equipment and resources, communication and human factors were considered as causal or contributory in more than a quarter of cases.

NAP4 data represented the very first clear demonstration of the fact that airway management accidents are not always linked to a missing (hi-tech) device, but rather to misuse of available devices or wrong positioning of a patient in an often missing airway management strategy environment.[7] What we have been witness to after NAP4 is probably the most radical change to our clinical practice in airway management since the introduction of the laryngoscope by Sir Robert Macintosh and the LMA by Dr Archie Brain: this is appreciation of the concepts of *non-technical skills* and *human factors*.

Significantly, when reviewing past practices, it is someway ironic that we already were aware of all these issues back in 1986 as expressed by Dr Bruce Scott: 'People don't die because of failure to intubate. They die either from failure to stop trying to intubate or from undiagnosed oesophageal intubation'.[11] The only true difference in this still tremendously relevant and present concept is that, with new awareness, we have now altered our terminology and definitions for such situations using terms such as *fixation error*,[12] *anchoring bias* and *confirmation bias*.[13]

And yet many more fixation errors can be found in critical accidents in airway management.[7] Among these are the misuse of videolaryngoscopes based on the wrong assumption that they might be universally applicable and successful.[14] We tend to forget that these new 'gadgets' on their own will not provide adequate oxygenation for our patients.[15] Another example is the on-going *scalpel versus cannula* debate for emergency front of neck access[16] which tends to draw our attention away from the fact that the best cricothyrotomy probably remains the one we do not perform.

Let our motto be: humans come before tools, strategy before instruments and target before devices.

A better understanding of these phenomena might come from a brief analysis and understanding of humans' ability to process, reason and make decisions.

The process of human thinking goes through interaction between *intuitive* thinking (the immediate response thinking and the *fight-or-flight* circuit) and *rational* thinking (the slow response thinking and the intellectual circuit).[17]

The learning process consists of reiterating the first reflection/lesson until it becomes a recognised pattern which can then be stored as a 'lesson learned' or defined as the 'second lesson'.

As a result, human beings evolve their abilities just as children learn how to walk through repeated falls; to be precise, we evolve through *trial and error*. This mechanism has some intrinsic pitfalls: when something goes wrong and there is no time to think, the intuitive reasoning overcomes the rational one for the sake of a fast response. This process (which we normally use to learn) becomes the source of *cognitive bias*, which is commonly referred to as *errors*.

Some may rightly argue that anaesthetists are among the most stressed human beings, lacking the capability of the above cognitive strategies under settings of massive stress. This understanding can and should be extended to airway management: it is paramount that we learn from our errors by focusing on what should be avoided rather than what we should do. Ultimately, our approach for provision of a safe airway for our patients should be based on the only true objective; ensuring their survival without inflicting any damage, which is not achieved merely by intubating everyone but through adequate oxygen delivery to brain and other vital organs.

In other words, we need to reformulate algorithms and our practice in light of oxygenation as the main (and unique) target, forgetting the role of single devices. We need to put these devices in the correct context of a decisional process. This shift in paradigm obviously requires a great effort since it calls for a radical alteration to our conventional institutional trust in our strategies and approaches. For instance, we would need to abandon the temptation of intubation at any cost in favour of *oxygenation at any cost*.

Beyond this, our biggest challenge is how to redefine the concept of error. What we should truly aim for is the transition from an event to be avoided and blamed to an unavoidable mechanism of our decisional patterns which should be transformed to a vital lesson.

The majority of medical errors descend from the cognitive bias mechanism, and a great number of sources of bias have been recognised and identified in root-cause analyses of various incidents.[18] A modern training methodology should wisely couple on the one hand the task of training, so-called technical skills, while on the other hand a clear emphasis should be placed on the 'non-technical issue' such as planning and preparation, teamwork and communication. This latter task should be achieved by incorporation of the most widely used and largely tested learning process: an approach of constructively using lessons learned from errors.

The true revolution requires institutional introduction of the *no-blame culture*, changing the perception of error by not focusing on the outcome (or by judging/blaming colleagues) but by studying the processes, using a magnifying glass (*audit* and *root-cause analysis*) and by introducing consequential corrective measures.

In civil aviation, the concept of error comes at a much higher price than in anaesthesia, and critical incident event numbers have different importance: a one case in 50 000 incidence,[7] 'Cannot intubate–Cannot oxygenate' (CI–CO) is perceived as a remote event in our perspective (insidiously lowering the awareness that an incident might happen at any time and dangerously altering our perception of the need for training), whereas a one in a million occurrence of engine failure is a serious concern for aircraft pilots, who might consider 1/50 000 as a regular occurrence.[19] Civil aviation experience clearly illustrates that the best approach to learn is through in-depth analysis of errors with simulation and checklists as instrumental cognitive approaches to correct errors.[20]

Airway management research and guidelines remain of paramount importance. However, in a broader perspective, they are not the necessary tools to be used during a crisis, due to lack of available time and because of the intrinsic urgency and complexity of the situation, requiring different mental processing. In such situations, we need fast-acting and easy-to-access cognitive aids, such as the winning formula of the *Vortex approach*,[21] proposed as 'high acuity implementation tool' for management of the CI–CO scenario.

Indeed, the most recent airway management guidelines already promote the nontechnical paradigm shift. The Difficult Airway Society (DAS) 2015 guidelines[22] clearly introduce the concept of 'stop-and-think' magic words in their algorithm. This concept is to be perceived as a handbrake encouraging us to slow down to automatic (intuitive) thinking in favour of the rational one, aimed at avoiding cognitive biases and to ignite the *thinking out-of-the-box* process.

The 2018 guidelines from DAS dealing with critically ill patients in the ICU,[23] prior to providing a devices-based algorithm, introduced pictures of ergonomy of monitor and crew positions (similar to a plane) either during or even before the airway crisis becoming a reality. Once again, target before device.

And it is not a coincidence that the United Kingdom remains the frontrunner of appreciation of the significance of errors and the importance of lessons to be learned. The NAP4 results unveiled the real incidences of airway accidents[7] and allowed a targeted implementation of corrective measures (including, but not limited to, airway devices) to reduce mortality and morbidity.[24] Nothing can be improved, as Leonardo Da Vinci stated, if we do not first measure it. Which is, in other words, the anticipation of the *no-blame* approach to errors, abandoning reticence and shame while learning from our *unavoidable* errors.

The modern anaesthetist should accept that he/she is no superhero and that airway management, difficult or easy as it might be, always requires teamwork. The entire process cannot solely be reduced to a question of intubation or extubation or the choice of device, but requires a perioperative and periprocedural pathway constantly targeting adequate patient oxygenation from admission to discharge.[25,26] The modern anaesthetist should acknowledge that nobody is flawless and that we all eventually commit errors despite our best intentions and efforts.

What we need to aim for is a scientific community, a working environment and European medicolegal system which will not point fingers or threaten with litigation but rather aim to transform our behaviour and our health system in a dynamic and visionary fashion by learning from lessons on a daily basis. It goes without saying that defensive medicine because of medicolegal issues constitutes a very counterproductive threat towards our desire to transform this cognitive behaviour.

Above all, as anaesthetists and as healthcare providers, we need to perceive checklists and cognitive aids as more than an unnecessary and annoying waste of time or an overdimensioned cure for emerging Alzheimer's disease; rather, we should embrace them as global positioning systems or sensors to assist in reversing a car. Simple tools to escape cognitive bias improve our practice and provide a safer and better cognitive ability during effort-demanding and critical situations.

To remain more focused, we need to appreciate and accept *human-proof* tools for crisis management.[27] The role of teachers, trainers and scientific societies in airway management should change in parallel: we should move beyond the frontal lessons of airway physiology or anatomy (which should be the unsubstitutable bases for our

individual learning). And we are past the stage of pure skill and device-training (which are growing daily in terms of numbers and complexity). These are only a part of the job; the true obstacle is implementation of a strategy to use errors constructively, introduction of a *no-blame* culture, promoting teamwork, bidirectional and assertive communication, and a strong call for the need to develop planning and strategy before acting. This last task strongly calls for implementation of cognitive aids in our practice and for greater use of simulation as teaching tool.[28]

In the end, to face the future, all we need is to reflect on our past. In essence, this is no different from the many falls of primates through their evolution before acquiring the ability to stand on lower limbs, or all the small bruises that come along for any normal smiling baby which embarks on walking dangerously around from the crawling stage. Let us shift the airway management paradigm from device to target.

In the words of the Chinese philosopher Lao Tzu, 'Mastering others is strength. Mastering yourself makes you fearless'.[29]

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