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Patient Safety

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Summary

Anesthesiology was the first medical specialty to champion patient safety as a specific focus. Anaesthesia is safer than ever owing to many different types of solutions to safety problems. Solution strategies have included incorporating new technologies, standards, and guidelines, and addressing problems relating to human factors and systems issues. A working party on Safety and Quality in Anaesthesiological Practice in the Section and Board of Anaesthesiolgy of the European Union of Medical Specialists has prepared a guidelines that amended and approved recently. Guidelines for safety and quality in anaesthesia practice are intended as a tool to optimize these important aspects in patients care in Europe. In the long term the most important contribution of anaesthesiology to patient safety may be the institutionalisation and legitimisation of patient safety as a topic of professional concern. Although anaesthesiology has made important strides in improving patient safety, there is still a long way to go. *Anestezjologia i Ratownictwo 2008; 2: 314-319.*

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Anesthesia has undergone enormous development since the discovery of the first anesthetic over 150 years ago. New drugs as well as refinements in techniques and equipment are in large part responsible for our ability to perform many of the sophisticated operations routinely performed today. However, anesthesia has no therapeutic benefit of its own. Therefore, the ideal administration of an anesthetic should place the patient at no risk beyond that of the surgical procedure.

The aviation metaphor has been aptly applied to describe the practice of modern anesthesiology. Induction and emergence are likened to takeoff and landing. On occasion during a long and uneventful anesthetic, a colleague may casually remark that the patient is on "autopilot". An aviation aphorism holds that *"There are old pilots, and there are bold pilots, but there are no old, bold pilots"*. So aviation accidents with serious injury or loss are seldom.

Serious medical error ratio varies between 3 to 7 percent [1,2].

The majority of accidents in many professions have been attributed to "pilot error".

Is it true for the anaesthesiology?

Table 1 shows average rate per exposure of catastrophes and associated deaths in various industries and human activities as a list of the risks in terms of deaths from the degree very unsafe to ultra safe. Anaesthesia in patient of ASA 1 has lower risk ratio than commercial large-jet aviation, railways and nuclear industry [3].

Traditional epidemiological studies on the incidence of adverse events related to anaesthesia have been conducted periodically from the 1950s onwards [4,5]. Australian Incident Monitoring Study analyzed 2000 incidents reports in 1993. Problems related with the human factor was found in 13% [6,7].

Table 2 shows anaesthesia-related complications according to the analysis of closed malpractice claims. Anaesthesia-related death was found in 23% [8].

Table 1. A list of the risks in terms of deaths from the degree very unsafe to ultrasafe

Himalaya mountaineering
Cardiac surgery in patient ASA 3-5
Microlight aircraft or helicopters
Medical risk (total)
Road safety
Chemical industry
Blood transfusion
Anesthesiology in patient ASA1
Commercial large-jet aviation
Railways
Nuclear industry

Five system barriers to achiveving ultrasafe health care. Amalberti R, Auroy Y, Berwick et al.: Ann Intern Med 2005; 142: 756-64.

Table 2. Anaesthesia-related Complications (n=1784)

	%
Death	23
Nerve injury	21
Cerebral injury	9
Burns/skin injury	6
Awareness	5
Eye injury	5
Lomber pain	5
Headache	5
Pneumothorax	4
Aspiration pneumonia	3
Newborn injury	1.5

ASA Closed Claims Study

Deaths which occur during the administration of anaesthetics require medicolegal investigations. In two studies from Turkey researchers formed a database for future comparisons related to anaesthetic-associated malpractice claims and also investigated the system of expertise, pertaining to such procedures. The decisions of the Supreme Health Council, whose expert opinion is requested by legal authorities (judges, prosecutors) for health workers brought in criminal courts, had been examined retrospectively over a 4-year period. Twenty one of the complications related to anaesthesia. Health workers were found to have different degrees of liability in the 16 of the 21 decision reports. This means 76% [9,10].

However, mortality and morbidity rate attributable to anaesthesia are going to decrease in years.

To some of us, who entered anaesthesia practice when admission of error by surgeons was unthinkable, and by anaesthetists untenable, a revolution in anesthetists' attitude has occurred. We are now beginning to acknowledge that just like the rest of the human race we anesthetists err constantly, repeatedly, and naturally. In fact, as Allnutt reminds us in an elegant paper, the learning process depends upon such erring, and has always done, so: *". . . all human beings, without any exception whatever, make errors and ... such errors are a completely normal and necessary part of human cognitive function."* [11].

In 1999 report To Err Is Human from the Institute of Medicine on errors in medical care. All of the following factors (and more) can come together to form a complicated chain of events that allows a medical error to occur [12]:

- large numbers of health care staff involved in provision of care resulting in multiple handoffs,
- poor communication between patients and staff and poor staff-staff communications,
- stress and fatigue,
- human factors design flaws,
- lack of appropriate education and training,
- higher acuity of illness,
- need for rapid decision-making,
- reductions in staffing,
- lack of redundancies to prevent error.

A health care provider may be involved but is not solely responsible. Anaesthesiologists are working in a team context. In most situations, not only the single health professional, but also the system (team, group, department and regulatory authorities) must be considered. The appropriate method most offen will be a systems approach. However, this does not exclude the responsibility of each doctor to strive for perfection from a quality assurance point of view.

Two approaches to the problem of human fallibility exist: the person and the system approaches [13]. The person approach focuses on the errors of individuals, blaming them for forgetfulness, inattention, or moral weakness.

The system approach concentrates on the conditions under which individuals work and tries to build defences to avert errors or mitigate their effects. Defences, barriers and safeguards occupy a key position in the system approach.

High technology systems have many defensive layers: some are engineered (alarms, physical bar-

riers, automatic shutdowns, etc), others rely on people (surgeons, anaesthetists, nurses etc), and yet others depend on procedures and administrative controls. Their function is to protect potential victims and assets from local hazards. Mostly they do this very effectively, but there are always weaknesses.

In an ideal world each defensive layer would be intact. In reality, however, they are more like slices of Swiss cheese, having many holes - though unlike in the cheese, these holes are continually opening, shutting and shifting their location. The presence of holes in any one "slice" does not normally cause a bad outcome. Usually, this can happen only when the holes in many layers momentarily line up to permit a trajectory of accident opportunity - bringing hazards into damaging contact with victims [12]. The holes in the defences arise for two reasons: active failures and latent conditions.

Active failures are the unsafe acts committed by people who are in direct contact with the patient or system. Active failures have a direct and usually short-lived impact on the integrity of the defences.

Latent conditions are the inevitable "resident pathogens" within the system. They arise from decisions made by top level management. Latent conditions have two kinds of adverse effect: they can translate into error provoking conditions within the local workplace (for example, time pressure, understaffing, inadequate equipment, fatigue, and inexperience) and they can create longlasting holes or weaknesses in the defences (untrustworthy alarms and indicators, unworkable procedures, design and construction deficiencies, etc).

Unlike active failures, whose specific forms are often hard to foresee, latent conditions can be identified and remedied before an adverse event occurs. Understanding this leads to proactive rather than reactive risk management. Once the range of patient safety problems in anaesthesiology had been defined, several strategies have been used to improve safety [14,15].

- All Anaesthesiological medical work must be led and personally supervised by a doctor anaesthesiologists.
- Every patient should undergo a doctor anaesthesists-led preoperative evaluation, and every effort to optimize the condition of the patient should be taken in the available time.
- Anaesthesists have an obligation to minimize the problem of fatigue as far as possible in the context in which they are working.

Other strategies decreasing human error is to apply technological solutions to clinical problems. Anaesthesiologists have become expert at realtime monitoring of patients (both electronically and via physical examination) [16,17].

- Minimum standards for available equipment should be defined at three levels (mandatory, recommended, possible).
- Electrocardiography, pulse oximetry and capnography have become standards.

Another technological strategy is the use of "engineered safety devices" that physically prevent errors from being made. A classic example is the system of gas connectors that prevent a gas hose or cylinder from being installed at the wrong site.

New technologies have also been developed for managing the patient's airway, resulting in a plethora of useful devices. In particular, the adoption of fibreoptic laryngoscopy has revolutionised the management of patients with known anatomical difficulties in endotracheal intubation, and the laryngeal mask airway has secured important niches in both routine and emergency airway management [15]:

- Guidelines for equipment handling should be in place.
- All equipment should be labelled and conform to ISO or other quality regulations.
- Equipment should be tested according to a checklist at defined intervales.
- Syringes should be colour labelled.
- All activities in the operating room must be systematically documented. Anaesthetic records should be kept in all cases.
- All departments should have a systematic approach to anaesthesia related problems and use these data for quality improvement strategies in the department.
- There should be a system in place to facilitate the doctor to review his/her own results, e.g. via anaesthetic chart.

Another strategy adopted by anaesthesiologists in the 1980s was the promulgation of standards and guidelines developed to provide guidance or direction for the diagnosis, management, and treatment of specific clinical problems:

- The monitoring standards.
- The management of the difficult airway
- Sedation and analgesia by non-anaesthesiologists.
- Office based anaesthesia standarts.

- Every anaesthesist must live up to national requirements of CME/CPD. Departments must allocate sufficient resources to facilitate this.
- Other anaesthesia providers should be trained according to a programme that will give them defined qualifications.

Anaesthesiologists have also been leaders in applying techniques and lessons from human factors engineering and the systems approach to safety [18]. Investigators have analysed the decision making processes in anaesthesiology with various methods, including:

- direct observation,
- review of videotapes of real cases,
- assessing the descriptions of cases presented at morbidity and mortality meetings,
- the use of patient simulators for research and training.

In the long term the most important contribution of anaesthesiology to patient safety may be the institutionalisation and legitimisation of patient safety as a topic of professional concern.

In conclusion:

- Anaesthesia is inherently high-risk.
- Safer than ever before.
- Knowledgeable, competent, careful and vigilant provider is the most important factor to decrease human error.
- Many system factors also important to reduce number of errors and recovery from errors.

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