Risks and Benefits of the Practice of Anesthesia

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Lecture Objectives

To review the occupational hazards of a career in anesthesia, strategies for their risk reduction, and the benefits of working within this specialty.

These are uncomfortable times to be in medical practice, and the pace of change is affecting all physicians.[1] It is disquieting that many within anesthesia are presenting a negative image of the specialty, for their pessimism is affecting others currently in practice, or those contemplating entering anesthesia training. This presentation will suggest that the occupational risks of anesthesia practice can be minimized, and that the many benefits of a career in the specialty remain to be enjoyed.

The Risks of Anesthetic Practice

Life Expectancy of Anesthesiologists

There has been considerable speculation over the years about the effect of the OR environment on the life expectancy of those of us who work there. In 1968, a retrospective survey of American anesthesiologists found that the death rate was less than that of the general male population, as was the death rate from all forms of cancer. However, there was a statistically significant increase in the incidence of cancer of the lymphoid and reticuloendothelial systems. A second prospective study [2] could not confirm this increased incidence of cancer, while a third study [3] also found no evidence for an increased death rate due to cancer, hepatic disease, or renal disease.

American anesthesiologists practicing between 1976 and 1996 were recently compared with a stratified random sample of internists (matched for sex, decade of birth, and American citizenship) utilizing the Physician Masterfile database, a listing of all USA physicians.[4] The cause of death was obtained from the National Death Index. Once again, no difference was observed in overall mortality, or death due to cancer or heart disease. However, suicides (RR=1.45), drug-related deaths (RR=2.75), non-motor vehicle accidents (RR=1.98) and HIV-related deaths (RR=1.78) were more common in anesthesiologists.

Elsewhere, death-in-post and early retirement due to ill health have been found to be increased significantly in consultant anaesthetists in England, in contrast to control consultants in five other medical specialties.[5,6] Unfortunately, that data was confidential, and we have no idea about the causes of death or the nature of the ill health leading to the early retirements.

The anaesthetic environment was initially speculated to be harmful due to the contamination with trace amounts of anaesthetic drugs. However, there has been no reported evidence of an increased incidence of cancer when animals have been exposed to low concentrations of anesthetics for a prolonged period of time. In addition, a mutagenic effect has not been observed when inhalation anesthetics have been studied in common *in vitro* tests for carcinogens. Nevertheless, risk reduction by scavenging of any foreign material and expired gases is both practical and logical. Unfortunately, the new hazards of occupational stress and proximity to addicting drugs appear to be far more significant to our “toxic workplace”, and not as easily managed.

Reproductive Hazards

Several years ago, epidemiological studies raised concern that exposure to trace concentrations of anaesthetic gases was related to an increased risk of spontaneous abortion and congenital birth defects. While most of the studies could be criticized for their design and comparison groups, the most compelling evidence for risk came from dental surgeries. In a large retrospective questionnaire of dentists and dental assistants, it was suggested that people who work in offices where nitrous oxide was used had a higher incidence of health problems than those working in offices where N_2O was not used. Women in the exposed offices had an incidence of spontaneous abortion 2.3 times the control group. Another questionnaire survey [7] suggested that dental assistants exposed to nitrous oxide had reduced fertility.

But these questionnaire surveys are very prone to responder bias. In addition, it has been shown that the increased risk of abortion is not limited to those who deliver anesthetics: in a Scandinavian survey the abortion rate for scrub nurses was 21%, for ICU nurses 17%, and for anesthesia nurses 15%. Finally, in a more objective study

using the computerized records of the Swedish Health Registry [8] to review the obstetric records of women who worked in the OR compared with women in other fields of medicine, there was no difference between the groups with regard to the incidence of threatened abortion, perinatal death rate, birth weight of offspring, or the incidence of congenital malformations.

Spence [9] conducted a survey from 1977 to 1984 of all UK female medical school graduates aged 40 years or less and working within a hospital. They collected data on details of occupation, work practice, lifestyle, medical and obstetrical history, as well as some personal details. Of the 11,500 women surveyed, there was an 85-92% response rate. They found that female anesthesiologists did not have an increased risk of infertility, and there was no correlation between spontaneous abortion or development of congenital anomalies in live-born children and the occupation of the mother, hours exposed to the OR environment, or the use of scavenging apparatus. There was also no increase in the incidence of cancer or neuropathy.

We must conclude, as did Boiven [10] in a meta-analysis of studies from the prescavenging era, that the possibility of a miscarried pregnancy is the only potential obstetric problem for OR personnel. But even that risk is very low (less than that for smokers, or people working in x-ray). The cause of any problem, if it does exist, is not obvious. However, the increased use of mask inductions with the newer inhalation anesthetics, as well as laryngeal mask airways with their inherent leaks,[11] may lead one to rethink the risks of working in the early stages of pregnancy.

Latex Sensitization

In recent years, the application of universal precautions to prevent transmission of infectious diseases has produced a new health concern: latex allergy. The sensitization of health care workers can lead to severe latex allergic reactions, including death from anaphylaxis (type-1 reactions). The basic problem is that work exposure generates IgE immunoglobins to proteins found in natural rubber products; when later exposed to allergens as a patient the individual is at risk of a fatal reaction. Even beyond the risk of death, the potential for career-ending disability such as occupational asthma is always present. More than 15 occupational fatalities were reported to the FDA between 1988 and 1992. It has been estimated that working in the health care field raises the risk of sensitization from 8% in the general population to 20%!

It is important to note that airborne latex allergen accounts for 80-90% of all exposures for most health care workers, with the greatest load coming with the donning and removal of powdered gloves.[12] The concentrations of allergen on gloves varies greatly, over 3,000 times between manufacturers. Even with the same product, there can be a 40-fold variation from lot to lot of the same brand. Other routes of exposure are many, including direct dermal contact, absorption through abraded skin, or mucocutaneous exposure. It has even been reported by indirect exposure in family members from contact with proteins from the health care workers surgical scrubs!

The individuals at greatest risk are those with a history of atopy or hand dermatitis, and frequent use of disposable gloves. A prevalence study conducted in Toronto physicians[13] and recently confirmed in the USA [14] showed that a history of glove symptoms did not reliably indicate latex allergy by skin test. Conversely, absence of glove symptoms does not rule out sensitization. The symptoms of sensitization are non-specific, and resemble those of an upper respiratory infection (tearing, redness, puffy eyes, nasal congestion, sneezing, wheezing, etc.), GI distress, or a non-specific rash, pruritus, or burning of the hands. The only clue may be a temporal relationship to working hours.

The logical risk reduction strategy is to stop the sensitization. Everyone in the OR should use non-powdered, low-allergen latex gloves, synthetic gloves, or vinyl gloves. In addition, since intact skin is an effective barrier, use water-based skin lotions and cover cuts and open sores with a plastic dressing.

Infectious Diseases

The first line of defense against infection is the routine use of protective barriers including gloves, gowns, and eye wear. When gloves are contaminated they must be removed before touching other patients, anaesthetic equipment, syringes, or other articles (such as one's pen to complete the chart!). Unfortunately, universal precautions are not universally applied: in one anesthetic study [15] compliance with gloving policy for induction was only 55% overall, and only 11% for faculty over the age of 55 years.

Contamination of the skin with blood occurs in 18% of peripheral venous insertions, 87% of central lines, and 38% of insertion of arterial lines. Gloving can reduce 98% of the contamination. Since penetrating injuries, particularly with hollow needles, are the most dangerous for disease transmission, it is worthwhile knowing that the incidence of needlesticks does not increase with the use of gloves. In a multicenter prospective study of percutaneous injuries in anesthesia personnel [16] 87 % of injuries were from hollow-bore needles, 43% were moderate or deep, and 68% of them were preventable with improved techniques.

Human Immunodeficiency Virus (HIV) Prevention

While receiving the greatest press, the estimated risk of HIV infection after a percutaneous exposure to blood or body fluids is only 0.3%. Risk factors for seroconversion include deep injury, visible contamination with the source patient's blood, procedures in which the contaminating device was placed inside the source patient's vein or artery, and terminal illness in the source patient.[17]

While the chance of infection after a single exposure may be slight, the prevalence of the disease in the population (0.3% of all subjects in the USA, but much increased in trauma patients) and the inevitability of accidental needlesticks makes the risk of occupational infection very real.

The risk management of post-exposure subjects has been recently changed in the UK, Canada, and the USA. In essence, it is now desirable to begin triple chemoprophylaxis immediately (within 1-2 hours, if possible) in high-risk exposures.

Hepatitis B Virus Contamination

In contrast to the low seroconversion after HIV exposure, the risk of HBV infection after a hepatitis B e-antigen positive needlestick injury is 37%. The prevalence of the virus in the surgical population is also greater than HIV, ranging from 0.2 to 1.5%. The HBV seroprevalence correlates best with the frequency of blood contact; the frequency of needle accidents has an independent but lesser effect. Risk reduction is effective by immunization with hepatitis B vaccine.

Hepatitis C Virus Exposure

The risk of HCV infection after an HCV blood-contaminated needlestick injury is about 2%; this rate has been established from occupational injury related to dialysis therapy. Unfortunately, not all patients with hepatitis C become antibody positive, so the test is not useful for establishing carrier status or chronic infection. The estimated prevalence of HCV in the American population is 2% and, since 25% of those infected will develop liver cancer, the risk to anesthesiologists should not be underestimated.

There is no vaccine against HCV; the only prevention relates to universal blood precautions. Immune globulin prophylaxis is no longer recommended after a percutaneous exposure to HCV. If exposed, one should monitor for hepatic injury by the most sensitive test available; treatment with interferon and ribaviron should begin at the first sign of infection.

Multiple-drug-resistant Tuberculosis

The number of new cases of TB has been steadily increasing in North America since 1985, as has the prevalence of drug resistance: it is now estimated that 33% of new cases in New York City were resistant to isoniazid. Since tuberculosis is transmitted through the air by droplet nuclei, anesthetists are at risk for infection from patients with active pulmonary disease.[18]

As to prevention of occupational exposure it is important to note that common OR masks are not effective at filtering the infective organism and leave too many face-seal leaks; special high-efficiency masks with greater filtering capability or personal respirators without leaks may be necessary. Routine surveillance of health care workers by annual skin testing is also recommended. BCG vaccination has not been shown to be cost effective compared to regular tuberculin testing and preventative therapy.

Stress-Related Illness

Occupational stress has been defined as “a negatively perceived quality, which, as a result of inadequate coping with sources of stress, has negative mental or physical health consequences”.[19] Stress arises from the interaction of the individual with their environment and occurs when there is a perceived imbalance between the demands made on the individual and their ability to meet that demand. While stress is an inevitable concomitant of both personal and professional life, and moderate levels provide the driving force for us to function properly, it is when it gets out of control that problems begin.[20]

The Association of Anesthetists of Britain conducted an interactive session in September, 1995, and defined to some extent the scope of the problem. They found that the principle sources of stress in anesthetic practice were lack of control (42% of respondents), administrative responsibilities (41%), and conflicts between the demands of work and home (35%).

But stress is not unique to anesthesiologists; in the 1998 CMA survey of Canadian physicians the majority reported feelings of frustration and fatigue.[21] In May, 1998, the registrar of the BC College of Physicians and Surgeons reported that “10% of the province’s doctors were being monitored for stress-related disability!” Concern for stress-related illness has led to a new psychiatric entity (“wounded care-giver”), and has led the CMA to publish a policy summary on physician health and well-being. The unique complaint of anesthesiologists is the inability to organize their own professional lives.[22] Once they reach their 40s and 50s most professionals expect to plan and control their own working pattern, and our inability to do so may prove increasingly stressful.

A recent USA study of aging and stress in anesthetic practice [23] showed that all ages found night call very stressful, and reported that as the most common factor leading to retirement. While the younger physicians found economic uncertainty, production pressure, and interpersonal relations more stressful than older age groups, the 40-49 year age group rated liability concerns as equally concerning.

The issues of sleep deprivation and fatigue on the performance of physicians in general, and anesthesiologists in particular, has received special attention. Studies have focused more on residents, and a survey of American anesthesiology residents [24] showed a pattern of sleep insufficient to sustain optimal function. This may be a factor in the twice-normal incidence of automobile accidents involving anesthesia residents after on-call duty cycles.[25]

Depression, disillusionment and dissatisfaction within medicine are widespread, and there is little evidence that it is

more marked in anesthetists as opposed to other doctors in hospital, community, or general practice. A 1988 survey in Canada of senior anesthesiologists [26] in Alberta and Ontario showed they were very satisfied with their work; the least satisfied were, on average, 7 years younger than the satisfied group. The study group was characterized as "intelligent, somewhat dominant yet sensitive, independent yet somewhat unsure and rather tense. They were also tolerant, shy, and rather serious.Women in the specialty were more tender-hearted, sensitive, and overprotective." Unfortunately, we do not have parallel information about the other specialties!

A USA survey from 1998 [27] correlated work stress in anesthesiologists with the number of hours in the OR. In addition, highly stressed individuals were more likely to report depression, fatigue, anger and irritability, and headaches and hostility. Another survey of 2,000 randomly-selected anesthesiologists in the USA suggested that academic practice is more satisfying than pure clinical work in a non-academic environment.[28] Once again, there was no "control' group of physicians from other specialties with which to compare the results from our specialty.

There are few recent studies about disruptions of family life of physicians. One 1997 report [29] showed a difference in divorce rates between the various specialties (led by psychiatrists), but anesthesiologists were not specifically identified.

Suicide is one outcome reported more commonly in the medical profession, and in anesthetists in particular.[4] A recent study in the UK found no increased risk in anesthetists (though we were more likely than others to be successful in our attempts), but confirmed the increased risk for doctors as a group compared to the general population.[6] Age was not a risk factor *per se*, but great concern was expressed over the number of suicides among trainees in anesthesia.

Alcohol abuse is reputedly more common in physicians than other groups, but evidence to support the impression is difficult to find. Anesthetists do not seem to be uniquely at risk.

Illicit drug use (marijuana and cocaine) was more common in Canadian interns and residents than in a general population. However, when compared with age-matched controls, there was no difference; the findings simply reflected the social mores of a particular age group.

Unfortunately, trainees in anesthesia and psychiatry were more common users than those in other specialties. A survey of one large American school showed no difference in the use of psychoactive substances by graduates of Internal Medicine (19.9%), Surgery (14.4%), or Anesthesia (16.8%).

It is now apparent that chemical dependency is an occupational disease of major importance to anesthesiologists. Based on the data from the ASA substance abuse survey, the incidence rate for new substance abuse (across all drugs) in the 1994-5 training year was 0.4% for residents, and 0.1% for attending staff. The specific rate for fentanyl abuse among residents was 0.25% for this training year. This actually represented a decline over the 10 years that the survey was conducted. The same survey found a relapse rate when physicians returned to anesthesia of 19% (6/31) in residents and 5% (1/20) in attending staff. A recent USA survey [30] suggests the chemical problem remains a risk throughout our professional careers.

Chemical dependence in physicians is a disease of loneliness, despair, increasing guilt and fear. It is not a "social" addiction that is the norm with marijuana, cocaine, or other drugs abused by those in other walks of life. Anesthesiologists make up only 4% of physicians but up to 30% of physicians in drug treatment programs; whether this is a detection phenomenon or a true incidence difference cannot be known. Contributing factors include job stress, isolation, lack of recognition, and lack of self respect. Of course, it is possible that the specialty attracts those with a susceptible personality, then places them in an environment with daily access to reinforcing substances.[32]

Risk Reduction of Stress-Related Disease

Stress reduction requires first, that we recognize that it occurs, in ourselves and others, and that we need to address causative factors from our daily lives. Individually, it is important that we simplify our existence to our own manageable level: limit the number of things we own, become involved with, or commit to complete. Success achieved at the expense of enjoyment of life is no success at all!

Anesthesiologists have to be taught to manage stressors effectively, and to learn the important skills of communication, assertiveness, conflict management, and time management. By becoming involved and knowledge-able in the processes within our hospitals we will find them less frustrating as change occurs. Finally, we must learn to control our anger, a powerful emotion directed either at ourselves or others.[33]

Tips to simplify one's life are available everywhere, but some of the best relate to keeping things in perspective. Most importantly for anesthesiologists, caught as we are on the treadmill of hospital production and tight timetables, is to remember the T3 Relationship: "Things Take Time!" Learn to relax, and understand that time is not always the imperative we make it out to be.

The Benefits of Anesthesiology

Job Opportunities

Recent years have seen dramatic changes in the way medical care is delivered, and how it is reimbursed. As a specialty, we have often left staff positions vacant rather than risking having too many mouths to feed from a diminished workload. This has left the impression that there are no jobs for graduates.

An analysis of the Canadian medical school graduates

from the 1996 CARMS match does not suggest that they even consider the job market, income potential, or prestige within the medical profession when they choose a career. The reasons that anesthesia was chosen were: doing a clerkship in the specialty (84%), interest in the unique practice of the specialty (78%), and role models in the field (75%). The role modeling of community anesthesiologists, observed while students are on other rotations, was particularly notable. An earlier 1993 survey suggested the attraction of anesthesia as "hands-on", "Time-off", "Physiology / Pharmacology", and "Immediate gratification". Can each of us remember being enchanted by this specialty for similar reasons?

In contrast, the USA medical school Graduates have a more earthly approach, perhaps because they accumulate greater debt during their education. A strong association has been noted between the expected earnings and prestige of a specialty and its attractiveness to medical students.[34]

In reality, there promises to be no shortage of jobs in either country. In Canada, the reduction in resident numbers imposed by regulatory governments, combined with impediments to immigration and expanded roles in perioperative medicine, will leave us short of practitioners for years to come. In the USA, in keeping with the unpredictability of a diffuse health care system, there appears to be an abundance of jobs for anesthesiologist as the role of CRNAs continues to diminish.[35]

Quality of Life

Anesthesia practice has the potential to meld one's personal life with a professional career. The regular hours of work, predictable duty roster, possibilities for job-sharing or reduced practice, and opportunity to pursue outside interests attract many candidates to the specialty. Indeed, our "outside interests" often make anesthesiologists the role models of a balanced medical career.[36]

A further benefit follows from the basic accountability of anesthesia: rather than being "on call" directly to the patient as occurs in a primary care field, anesthesiologists respond to the needs of our medical institutions. The calls are always genuine, and occur on a scheduled basis; when "off-call" anesthesiologists are seldom required to respond. Few medical specialties possess such an advantage!

Quality of Practice

All repetitive duties become monotonous over time; anesthetic practice is no different. However, anesthesia is one of the "horizontal" specialties that bring us into contact with patients of virtually all other physicians. Whether it is in the OR, the ICU, X-ray department, clinic, or labor floor we participate in the full scope of medical service. There are very few other practices that share this advantage; most are vertically organized to limit their case-load by either patient characteristics (pediatrics, obstetrics, etc.) or by organ system (ophthalmology, orthopedics, urology, etc.). As long as we remain connected with the mainstream of patient volume and the broadest scope of practice, we will remain stimulated by medical progress and satisfied with our facilitating service role.

Financial Reward

The unfortunate part of recent health care reform has been the financial impact upon individual practitioners. Before 1993, anesthesia departments were major money-makers for hospitals and medical schools, and the rewards to providers were rising yearly. However, since that time, with managed care in the USA and hospital reform in Canada, the tables have turned. The institutions have learned that "the cheapest care is no care" but, when care must be provided, it should be provided at the cheapest cost. In essence, anesthesia moved from being an asset to representing a cost liability in a remarkably short time!

In the USA, the Medical Group Management Association tracks financial data of various specialties. The basis for anesthesia figures is from 1,347 anesthesiologists in private practice, and a further 1,183 working in academic settings. Income is measured by median gross compensation for 1997, as reported in 1998:

Median gross compensation for 1997 (USA)

Specialty	Private Sector Physicians	Academic Faculty
Anesthesiology	$237,390	$170,000
Family Practice	$132,434	$120,000
Internal Medicine	$140,000	$112,972
Pediatrics	$132,039	$105,846
Emergency Medicine	$179,997	$148,737
Surgery: General	$223,388	$198,135
Surgery: Orthopedic	$310,475	$246,113

In Canada, we do not have the same need to negotiate physician contracts, so our data run a bit late. However, the CMA does utilize data from the Canadian Institute for Health Information (CIHI), based upon billing data from provincial medical care plans, to determine the average gross fee-for-service payment per physician. These are corrected to averages for a full-time-equivalent, and are presented broadly by specialty. The gross billings can then be corrected for estimated overhead %s as determined by the CMA from survey information.

It seems that we are still doing well in both countries, in comparison with our colleagues in other specialties as well as to the rest of society. This is particularly true when one considers that maximal practice earning follows almost immediately upon graduation from anesthesia residency.

But some anesthesiologists, particularly in the USA, have seen their earnings drop in recent years. If compensation / unit of service is declining due to restraint, restructuring, or clawbacks, physicians will work harder and smarter.

Average FFS payments per full-time equivalent MD (Canada)			
Group	**1993-94 Gross Estimated**	**Overhead %**	**Average Net (before tax)**
Anesthesia	$172,353	17%	$143,053
Family practice	$157,044	39%	$ 95,483
Medical Specialists	$170,915	29%	$121,521
Surgical Specialists	$228,673	36%	$144,979
All Physicians	$173,095	36%	$110,608

Anesthesiologists have difficulty doing so independent of the OR, leaving limited opportunity to compensate for changes in the system of funding. Their only option is to understaff the department, and independently put in more clinical hours to maintain personal income. While understaffing in the early 1990s seemed appropriate, most anesthesiologists now have more than enough work to do, and the present service loads are encroaching on personal and academic non-clinical time.

Anesthesiologists (and other physicians) may perceive themselves as victims of the recent reengineering of medical services, for they are now valued only as a "service industry" contributing to the smooth functioning of our medical care facilities. The scrutiny of outcomes and effectiveness of care is leading many to consider anesthesiologists (and other MDs) as part of a process or program rather than a discrete department or individual practitioners. The transition has upset our traditional self-image, but we have been rewarded with expanded responsibilities in initiatives such as perioperative medicine and OR management. It may not be the role we envisioned when we chose our career path, but it secures our place in the health care of the future.

Conclusion

On balance, an examination of the risks and benefits of a career in anesthesia gives reason for optimism. The physical and psychological risks we endure can be easily reduced by simple measures; the benefits can be profound.

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