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Occupational Risks, Safety and Well Being among Anesthesiologists

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"Anaesthesia is either awfully simple or simply awful!''

1. Introduction

Anaesthesiologists experience high levels of occupational fatigue, burnout syndrome, chemical dependency, mental depression, suicidal ideation and various other physical and mental stress related disorders. Amidst the real needs of patients and the indifference of the managers, the anesthesiologist attempts to search for some solutions to mitigate daily difficulties. There is a need, therefore, to recognise and then deal with these stressors and their adverse effects.

Anesthesiologists worldwide need to come together to raise the profile of their wellbeing by identifying and sharing approaches to combat occupational fatigue, stress or anxiety at work. Organizational, professional, and personal interventions can dramatically enhance the health and well-being of anesthesiologists and reduce their stress levels and demotivation.

Burnout is a severe problem affecting medical personnel and healthcare organizations. Burnout has many consequences for the individual including physical illness, increased feelings of hopelessness, irritability, impatience, and poor interpersonal relationships with family/ coworkers / patients. In severe cases, burnout can cause diminished executive functioning, attention, and memory. Burnout can be assessed for severity and cause, and remedied by individual intervention and organizational changes. Addressing the issue of burnout, can help increase personal wellness, and improve patient safety, satisfaction, and quality of care. (1)

Risks related to anesthesiology practice
Anesthesiologists' occupational risks are classified according to the type of agent or situation that triggers the hazard.
These include the following:-

1) Occupational exposure hazards
2) Occupational stress
3) Psychosocial disorders
4) Drug addiction
5) Ergonomic issues

2. Occupational Exposure Risks and Hazards

2.1 Risks related to biological agents

Anesthesia personnel are at risk for acquiring infections from patients and from other personnel. This risk is likely to increase because as antimicrobial agents become more effective, the pathogens develop resistance and new survival strategies. In addition, increasingly immune-compromised patients become vectors for these resistant, opportunistic organisms. Furthermore, globalization brings with it increasing spread of organisms from less developed areas in the world. Since asymptomatic carriers of many blood-borne viruses cannot be identified, universal precautions were recommended for use during all patient contact. Although exposure to blood carries the greatest risk of occupationally related transmission of pathogens, it was recognized that universal precautions should also be applied to semen, vaginal secretions, human tissues, and cerebrospinal, synovial, pleural, peritoneal, pericardial, and amniotic fluids.

Standard precautions include the appropriate application and use of hand washing, N 95 respirator, personal protective equipment (PPE), and respiratory hygiene/cough etiquette. The selection of specific barriers or PPE should be commensurate with the task being performed. Gloves may be all that is necessary during many procedures that involve contact with mucous membranes or oral fluids, such as during routine endotracheal intubation or during insertion of a peripheral intravenous catheter. However, additional personal protection, such as gown, mask, and face shield, may be required during endotracheal intubation when the patient has hematemesis or during bronchoscopy or endotracheal suctioning. Respiratory hygiene/cough etiquette has been added to standard precautions to prevent droplet transmission of respiratory pathogens, especially during seasonal outbreaks.

Needlestick injuries are due to overuse of injections and unnecessary sharps, lack of disposable syringes, safer needle devices, and sharps-disposal containers, lack of access to and failure to use sharps containers immediately after injection, inadequate or short staffing, recapping of needles after use, passing instruments from hand to hand in the operating suite and lack of awareness of hazard and lack of training.

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Factors that increased risks of transmission of include a deep wound, visible blood on the device, a hollow-bore blood-filled needle, use of the device to access an artery or vein, and high-viral-load status of the patient.

Infections transmitted by patients with the following pathogens:

- Viruses: Commonly Hepatitis B, Hepatitis C, HIV, SARS-CoV-2, Covid-19. Healthcare-associated viral infections may occur in a variety of healthcare settings, including clinics, emergency centers, urgent care centers, procedure suites, operating rooms, hospital wards, nurseries, and intensive care units. In addition, non-patient care areas, such as the cafeteria, waiting areas, and playrooms may also be a source of viral infections that can spread in the healthcare setting. These infections may be device-related or transmitted via blood products or organ donation and respiratory droplets, through food including human milk, person to person, or via air ducts, fomites, and surfaces. Both DNA and RNA viruses, either common or exotic, may contribute to healthcare-associated viral infections. Advances in molecular viral diagnostics have enabled rapid detection and routine surveillance for viral infections and now allow early identification of viruses. Prompt identification allows timely containment measures to minimize transmission to other patients or healthcare workers and avoids hospital, community, and global outbreaks. (2)
  Hepatitis B vaccine provides both pre exposure and post exposure protection against HBV infection. Recombinant DNA vaccine is advised with three intramuscular doses of hepatitis B vaccine that provide a protective antibody response in >90% of healthy recipients. Adults who develop a protective antibody response are protected from clinical disease and chronic infection. Long-term studies of immunized adults and children indicate that immune memory remains intact for at least 12 years. Booster doses are not advised.(3)
  Chemoprophylaxis for HIV within hours of exposure is a two-drug regimen, using two nucleoside analogue reverse transcriptase inhibitors, usually Zidovidine and lamivudine for four weeks after baseline blood tests. HIV antibody testing should be performed for at least 6 months post exposure (e.g., at 6 weeks, 12 weeks, and 6 months).
- Bacteria
- Fungi

Other Risks related to physical agents:

- Ionizing radiation- Anaesthesiologists can be exposed to ionizing radiation from X-rays and to non-ionizing radiation from lasers. Although the dose after an individual exposure may be extremely small, repeated episodes may lead to cumulative exposure with potentially adverse health effects. The monthly cumulative dose of radiation measured in a trauma theatre has been shown to be undetectable and the annual radiation exposure calculated to be below the dose limit of 15 mSv yr^{-1} (4)
- Non-ionizing radiation (laser) - Exposure to non-ionizing radiation from lasers may occur either through direct exposure or reflection. Resulting injuries include burns to the cornea and retina, destruction of the macula or optic nerve and cataract formation. Protective eyewear is designed to filter out radiation produced by specific lasers while still permitting vision and should be worn at all times when lasers are in use Intraoperative suction should be used to reduce exposure to diathermy and laser smoke inhalation.
- Noise and vibration- Acoustic noise is produced by the vibration of the switched gradient coils during MRI scanning and may exceed recommended safe levels of 90dB for 8 hours or 100 dB for 2 hours. Ventilators, suction equipment, music, and conversation produce background noise at a level of 75 to 90 dB. Superimposed on these are sporadic noises caused by dropped equipment, surgical saws and drills, and alarms. Resultant noise levels can exceed 100 dB over 40% of the time with peak levels in excess of 120 dB, which is comparable to the clamor of a busy freeway or a rock and roll band Anesthesiologists must wear ear protectors during a scan.
- Temperature –Hypo and hyperthermia
- Ventilation- high concentrations of anesthetic gases and volatiles agents
- Lighting- monitor glare, reflections off stainless steel trays and trolleys, LED OT lights
- Electric charges (high and low voltage) due to improper earthing
- Fires and explosions- due to flammable anesthetics, oxygen leaks, lack of scavenging systems, diathermy/electrosurgical equipments. Inhalation of smoke and vapour generated by the use of surgical diathermy and lasers represents a potential hazard to anaesthetists. Surgical masks do not filter toxic gases nor trap particles <0.5 µm in diameter. The median diameter of particles produced in smoke plumes is 0.31 µm. The smoke plume generated by diathermy has been found to contain carcinogens such as benzene. Other chemicals (e.g. toluene, styrene, carbon disulphide) have been identified in diathermy smoke and can cause corneal irritation, dermatitis, renal and hepatic toxicity and affect the central nervous system. Viable bacteria, human papilloma virus DNA and HIV pro viral DNA have also been found in laser. Operator exposure can be reduced effectively by suction devices; their routine use is advisable. (5)
- Compressed medical gas cylinders- leaks and explosions

Risks related to work standards (organization):

- Organization and type of work- Covid 19 ward duties
- Work pattern- shortage of staff leading to overwork
- Calendar, workload, density of tasks- in high density operation theatres
- Violence- due to emergence delirium and assaults during anesthetic fatalities

Risks related to chemical agents:

- Latex allergy- Reduce risk of developing latex allergy by avoiding latex products and washing hands after contact with latex.
- Exposure to trace concentrations of volatile anesthetics and gases- Exposure to anaesthetic agents can cause hepatic disease, reduced mental performance and reduced manual dexterity. Evidence also suggested a higher rate of

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spontaneous abortion among female anaesthesiologists exposed to anaesthetic gases with greater incidence of congenital abnormalities in children of both male and female anaesthesiologists. Control measures include good anaesthetic practice, frequent changes of theatre air and gas scavenging. Despite these precautions atmospheric pollution will still occur in some clinical situations, for example inhalation induction, mask ventilation and leaks around uncuffed paediatric tracheal tubes. National Institute of Occupational Safety and Health (NIOSH) recommends not to exceed threshold values of 25 parts per million (ppm) for nitrous oxide. The exposure limit for volatile anesthetic agents is 2 ppm without concomitant nitrous oxide exposure whereas with concomitant nitrous oxide exposure it should not exceed 0.5 ppm. (6)

Occupational Stress among Anesthesiologists

Occupational stress refers to the physical and emotional reactions that occur when demands at work exceed the capacity, tolerance, resources and needs of the anesthesiologist. Excessive stress can lead to serious consequences such as deteriorating work performance that may impact the safety of patients and anesthesiologists alike, and compromising professionals' health.

Incidence: While the incidence of occupational stress among all doctors is 28%, it is even higher among anesthesiologists, reaching 50% to 96%.

The most stressful factors in anesthesiologists' opinions are:

- Lack of control over their workday (83%),
- Jeopardized family life (75%),
- Medical and legal aspects (66%),
- Communication problems (63%),
- Clinical problems (61%).
- Management of critical patients (28%)
- Crisis management (23%),
- Dealing with death (13%),
- Problems related to work pattern (organizational, 42%)
- Administrative responsibilities (41%),
- Personal conflicts (35%),
- Conflicts in professional relationships (25%),
- Conflicts outside the work environment (23%),
- Medical and legal problems (2.8%).

Chronic occupational stress is dynamic and insidious and the persistent cycle of stress can cause gradual and permanent damage to the body as following:

- Physical diseases: chronic fatigue, gastroduodenal ulcer, gastritis, hypertension, arrhythmia, angina, musculoskeletal diseases, neurological disorders, decreased immunity, reproductive disorders and increased risk of spontaneous abortion
- Psychological disorders: psychic emotional deterioration, such as anxiety (19 %), distress (43%) and depression (31%). Increased risk of suicide
- Behavioral disorders: alcohol abuse (44%), psychotropic drug use (16 %), drug abuse (1, 7%) and aggressive behavior.
- Intellectual changes: difficulty to concentrate, impairment of vigilance, reduced work performance.

Burnout

Healthcare professionals at the front line of care (family medicine, emergency medicine, general internal medicine, and critical care) report the highest rates of BOS; in excess of 40%. Working in an Intensive Care Unit (ICU) can be especially stressful due to high patient morbidity and mortality, challenging daily work routines, and routine encounters with traumatic and ethical issues. This level of nearly continuous stress can rapidly accelerate when caregivers perceive that there is insufficient time or limited resources to properly care for patients.

First described in the 1970s, BOS is a work-related constellation of symptoms that usually occurs in individuals without any prior history of psychological or psychiatric disorders. BOS is triggered by a discrepancy between the expectations and ideals of the employee and the actual requirements of their position. Chronic and cumulative imbalance between psychological and professional demands leads to individuals experiencing emotional stress and increasing job-related disillusionment, along with other issues related to work organization.

Risk factors

a) Individual: poor self esteem, maladaptive coping mechanisms, idealistic young adults, unrealistically high expectations, financial issues, injustice, lack of professional recognition, conflict of principles, loss of control over taskscc
b) Organizational: Heavy workload, conflict with co workers, diminished resources, lack of control, effort-reward imbalanace, understaffing, excessive bureaucracy
c) In ICU: variable work schedules, rapid patient turnover, end-of-life events

The most important determinants of occupational stress include the following:
History of 7-10 years of employment, long working hours, night shifts, work overload, professional commitment, responsibility roles (the position of head of anesthesiology services is an important risk factor, as it increases in 51% the incidence of Burnout syndrome), lack of control over routine, personal life and family relationships, chronic fatigue and unfulfilling relationships at work.

Symptoms

- Physical: fatigue, sleep disorders, headache, impotence, gastrointestinal disorders.
- Psychological: irritability, anxiety, depression, hopelessness.
- Behavior: aggressiveness, defensive behavior, cynicism, drug abuse.
- Professional: absenteeism, decreased performance, lack of commitment.
- Personal: poor communication, isolation and poor concentration. As it develops, burnout syndrome may cause serious consequences, such as:
- Vehicular accidents related to heavy workload, especially at night.
- Several psychological/psychiatric disorders, mainly anxiety, distress and depression.
- Drug abuse (escape mechanism).

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- Suicidal ideation

Burnout Assessment: The Maslach Burnout Inventory (MBI) can assess the level of burnout. The MBI-HS is a 22-item self-report questionnaire that consists of three independently scored dimensions (emotional exhaustion, depersonalization and a lack of personal accomplishment). The questions on the MBIHS classify feelings related to an individual's work environment on a 7-point Likert scale. The emotional exhaustion scale includes 9 items and identifies individuals who are emotionally exhausted or who feel overextended at work. The depersonalization scale includes 5 items and identifies those who have an impersonal response to patients they are taking care of and the personal accomplishment scale includes 8 items and assesses a lack of accomplishment and success related to work.

Parameters measured are:

- Emotional Exhaustion: feelings of being emotionally overextended and exhausted by work.
- Depersonalization: unfeeling and impersonal responses toward recipients of one's service, care, or treatment.
- Personal Accomplishment: feelings of competence and successful achievement in one's work with patients
- Co-workers have an important role: Usually the first ones to notice and make an early diagnosis.. Colleagues can help each other to reflect on their experiences. Colleagues can provide psychological support in or out of the workplace, since they experience similar situations.
- Companies that deal with anesthesiologists in their staff should develop occupational health programs that include mental health and counseling for professionals that develop burnout symptoms. Institutions must devise strategies for early recognition and diagnosis of individuals at risk and provide medical and psychological support in symptomatic cases.
- The imbalance between workload and time for rest and leisure underlines a major risk factor: inadequate work schedules. (7)

Treatment

a) Changes in eating habits, sleep, rest, satisfaction and greater work opportunities.
b) Appropriate work schedules, adequate work infrastructure, occupational protection and improvements to the workplace. Avoiding isolation, decrease the intensity of routine, reach balance between family, friends, work and rest

- If necessary, seek professional psychological counseling
- Institutional positive attitudes
- Try to ensure balance between the amount of work and anesthesiologist's skills and resources
- Provide opportunities for professionals to utilise all their skills - there must be a meaning for each activity accomplished
- Define roles and responsibilities of the anesthesiologist clearly
- Involve anesthesiologists in the decision-making when potential change affects their routine
- Optimize communication
- Reduce uncertainty - setting career plans and explore future job opportunities
- Providing opportunities for social network among workers
- Establish schedules (working hours) that match anesthesiologists' demands and responsibilities
- Foster balance between work, family and social life. Improve safety measures inside the operating suite;
- Improve infrastructure.

Recommendations to Minimize Occupational Stress Among Anesthesiologists

Develop a work system with predefined limits: working-hour limit per day/week, breaks between long working periods, overtime and night shifts, time to rest between shifts, weekly rest schedule, annual vacations.

- Not working more than 5 or 6 hours shifts without small breaks in between.
- Not working more than 10 consecutive hours per day.
- Balancing work and family life.
- Avoiding more than two overnight shifts of 12 hours per week.
- Distributing days off evenly
- Not working for two consecutive shifts.
- Not taking on another shift without a break of at least 10 hours between them.
- Resting and restoring sleep on the day after a 24-hour shift.
- Establishing a 30-minute break during 8-hour shifts.
- Establishing two 30-minute breaks during a 12-hour shift, one of which should occur at a suitable time for dining.
- Avoiding night shifts after being 55 years of age.
- Having a 15-day leave for every four months of work.

There must be a well-structured room for anesthesiologists to rest and take a nap during breaks, dining and reading places with air conditioning, silence and no environmental pollution

Examples of occupational well being practices:

- Take routine rest breaks
- Talk to colleagues about wellbeing
- Raise concerns about stress with seniors
- Encourage a good work-life balance in the department
- Look after fellow anaesthesiologists
- Implement work-place risk assessments
- Learn to say no to calls, if you feel you're not in good shape
- Feed and hydrate yourself properly during the workday
- Work on emotional intelligence, assertive communication, collaborative work, empathy and compassion.

3. Psycho Social Disorders among Anesthesiologists

A psychosocial disorder is a mental illness caused or influenced by life experiences, as well as maladjusted cognitive and behavioral processes.

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The term psychosocial refers to the psychological and social factors that influence mental health. Social influences such as peer pressure, parental support, cultural and religious background, socioeconomic status, and interpersonal relationships all help to shape personality and influence psychological makeup. Anesthesiologists with psychosocial disorders frequently have difficulty functioning in social situations and may have problems effectively communicating with others.

16 different subtypes (or categories) of mental illness come under this heading. The major categories of mental disorders thought to involve significant psychosocial factors include:

- Substance-related disorders. Disorders related to alcohol and drug use, abuse, dependence, and withdrawal.
- Schizophrenia and other psychotic disorders. These include the schizoid disorders (schizophrenia, and schizoaffective disorder), delusional disorder, and psychotic disorders.
- Mood disorders. Affective disorders such as depression (major, dysthymic) and bipolar disorders.
- Anxiety disorders. Disorders in which a certain situation or place triggers excessive fear and/or anxiety symptoms (i.e., dizziness, racing heart), such as panic disorder, agoraphobia, social phobia, obsessive-compulsive disorder, post-traumatic stress disorder, and generalized anxiety disorders.
- Somatoform disorders. Somatoform disorders involve clinically significant physical symptoms that cannot be explained by a medical condition (e.g., somatization disorder, conversion disorder, pain disorder, hypochondriasis, and body dysmorphic disorder).
- Factitious disorders. Disorders in which an individual creates and complains of symptoms of a non-existent illness in order to assume the role of a patient (or sick role).
- Sexual and gender identity disorders. Disorders of sexual desire, arousal, and performance. It should be noted that the categorization of gender identity disorder as a mental illness has been a point of some contention among mental health professionals.
- Eating disorders. Anorexia and bulimia nervosa.
- Adjustment disorders. Adjustment disorders involve an excessive emotional or behavioral reaction to a stressful event.
- Personality disorders. Maladjustments of personality, including paranoid, schizoid, anti-social, borderline, histrionic, narcissistic, avoidant, dependent, and obsessive-compulsive personality disorder (not to be confused with the anxiety disorder OCD).
- ADHD) may be partially psychosocial in nature.

Causes and symptoms

The majority of psychological disorders are thought to be caused by a complex combination of biological, genetic (hereditary), familial, and social influences. These differ from person to person, so that a disorder caused by genetic factors in one person may be caused by a traumatic life event in another. Anesthesiologisdts with psychosocial dysfunction usually have difficulty functioning normally in social situations and may have trouble forming and maintaining close interpersonal relationships.

Diagnosis

Patients with symptoms of psychosocial disorders or other mental illness should undergo a thorough physical examination and a detailed social and medical history must be taken to rule out an organic cause for the illness (such as a neurological disorder). One or more psychological tests (also called clinical inventories, scales, or assessments) can also prove useful.

Treatment

Counseling is typically a front-line treatment for psychosocial disorders. A number of counseling or talk therapy approaches exist, including psychotherapy, cognitive therapy, behavioral therapy, and group therapy. Therapy or counseling may be administered by social workers, counselors and therapists, psychologists, or psychiatrists.

Psychoactive medication may also be prescribed for symptom relief in patients with mental disorders considered psychosocial in nature. For disorders such as major depression or bipolar disorder, drug therapy is a primary treatment approach. In cases such as personality disorder that are thought to not have biological roots, psychoactive medications are usually considered a secondary, or companion treatment to psychotherapy.

Regular attendance in self-help groups or 12-step programs such as Alcoholics Anonymous that allow individuals to seek advice and counsel from others in similar circumstances, can be extremely effective.

In patient treatment is usually employed in situations where a controlled therapeutic environment is critical for the patient's recovery (e.g., rehabilitation treatment for alcoholism or other drug addictions), or when there is a risk that the patient may harm himself (suicide) or others. It may also be necessary when the patient's physical health has deteriorated to a point where life-sustaining treatment is necessary, such as with severe malnutrition associated with anorexia nervosa.

Alternative treatment

Therapeutic approaches such as art therapy that encourage self-discovery and empowerment may be useful in treating psychosocial disorders. Art therapy, the use of the creative process to express and understand emotion, encompasses a broad range of humanistic disciplines, including visual arts, dance, drama, music, film, writing, literature, and other artistic genres. This use of the creative process provided the sick anesthesiologist with a means to gain insight to emotions and thoughts he or she might otherwise have difficulty expressing. After the artwork is created, the patient/artist continues the therapeutic journey by interpreting its meaning under the guidance of a trained therapist. (8)

4. Drug Addiction

Opioid addiction still remains a major issue in the anesthesia workplace. Although alcoholism and other forms of impairment, such as addiction to other substances and mental illness, impact anesthesiologists at rates similar to

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those in other professions, the drug of choice for anesthesiologists entering treatment remains an opioid with fentanyl and sufentanil topping the list. Other agents, such as propofol, ketamine, sodium thiopental, lidocaine, nitrous oxide, and the potent volatile anesthetics, are less frequently abused but have documented abuse potential.

The high incidence of drug abuse among anesthesiologists include the proximity to large quantities of highly addictive drugs, the relative ease of diverting particularly small quantities of these agents for personal use, the high-stress environment in which anesthesiologists work, and exposure in the workplace that sensitizes the reward pathways in the brain and thus promotes substance abuse.

Many of these individuals have preexisting comorbid traits such as novelty-seeking and antisocial behavior, that may have a genetic basis for both the susceptibility to dependence and these comorbid traits. The cholinergic muscarinic 2 receptor has been associated with the function of memory and cognition and variation in the gene responsible for the production of this receptor predisposed to both alcohol dependence and major depressive syndrome. individuals with the same personality traits tend to self-administer drugs from the same class, *i.e.*, opioids for anxiety and depression and amphetamines for attention deficit and hyperactivity states,

Some of the changes typically observed in the affected anesthesiologist include but are not limited to the following:

- Withdrawal from family, friends, and leisure activities
- Mood swings, with periods of depression alternating with periods of euphoria
- Increased episodes of anger, irritability, and hostility
- Spending more time at the hospital, even when off duty
- Volunteering for extra call
- Refusing relief for lunch or coffee breaks
- Requesting frequent bathroom breaks
- Signing out increasing amounts of narcotics or quantities inappropriate for the given case
- Weight loss and pale skin

Alcohol addiction typically takes years to become apparent, whereas addiction to the short-acting opioids, fentanyl and especially sufentanil, becomes apparent over the course of a few months of use. Seemingly reasonable and intelligent anesthesiologists may resort to unbelievable behavior in order to obtain their drug of choice. Addicts may chart the use of an agent when in fact either an alternate agent or none at all was administered. Entire cases may be done with inhalational agents and charted as opioid based. Addicts may substitute a syringe containing their drug of choice for one containing saline during a relief break. Some may even rummage through sharps containers looking for residual drugs in discarded syringes. Addicts quickly become proficient at removing controlled substances from secure places.

Depending on the half-life of the abused agent, tolerance can develop rapidly. It is not uncommon for the addict in recovery to report self-administration of 1,000 μg fentanyl in a single injection, often simply to relieve the symptoms of withdrawal. When looking over the records of an addicted anesthesiologist, an increase in the quantity of opioids requested, particularly over weekends can often be noted. (9, 10)

Treatment

Treatment involves detoxification, monitored abstinence, intensive education, exposure to self-help groups, and psychotherapy. Urine testing is still the cornerstone for monitoring and documenting abstinence in the recovering addict. Naltrexone, like naloxone, is a relatively pure μ-receptor antagonist. In contrast to naloxone, naltrexone is highly effective orally and still remains part of the treatment for anesthesiologists returning to the operating room. Recent studies suggest that naltrexone may reduce the cravings for both narcotics and alcohol in the recovering addict. The drug produces sustained competitive antagonism of opioid agonists for as long as 24–48 h and is taken as either 50 mg daily or 100 mg three times per week. Detoxification is mandatory before prescription of naltrexone, because ingestion without detoxification will precipitate a severe withdrawal syndrome. Ultrarapid detoxification centers operate on the premise that continued opioid use results from the attempts to avoid withdrawal symptoms, and that elimination of these symptoms can ensure prevention of relapse. Rapid treatment with naltrexone is performed after induction of general anesthesia to relieve them of the physical symptoms of withdrawal and placed on opioid antagonist maintenance to prevent cravings and relapse. This fast tracking technique can even be done on a day case basis in some centres.

Ergonomics related to the anesthesiologist

The word "Ergonomics" is derived from two Greek words, ergos = workv and nomos = basis or foundation. Ergonomics, or human factors engineering, is the scientific study of interactions between humans and other components of a system. The purpose of ergonomics is to promote operational efficiency and to decrease human error. The objectives of ergonomists are to improve safety, performance, and well-being by optimizing the relationship between people and their work environment. Ergonomics is the discipline of designing and testing the human/systems interface with the goal of improving interactions. In the broadest terms, ergonomics deals with the study and enhancement of the tools and systems used by humans to interact with the physical world around them

Within anesthesiology, ergonomics promotes patient safety by reducing stress and strain on the user. Ergonomic design is the application of this body of knowledge to the design of tools, machines, systems, tasks, jobs and environments for safe, comfortable and effective use. To apply ergonomics in the anesthesia work environment, a model of the anesthesia provider at work needs to be created. This model must consider three elements, the anesthesiologist, his equipment, and the patient and also two interfaces, ergonomics and machine design. The areas studied in ergonomics include equipment design, workplace layout, environmental conditions such as lighting, and the related questions of skill acquisition, productivity, and safety. Many anesthesia equipment are flawed by the lack of sufficient human factors

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expertise in their design. Poorly designed equipment detracts from the safety and efficiency of anesthesia practice. Those involved in designing, developing, manufacturing, or marketing medical systems must better utilize human factors knowledge and expertise. Human factors knowledge should be included in the earliest phases of product development. Work-related musculoskeletal disorders are prevalent among anesthesiologists and surgeons. This problem has received little attention owing to under-reporting of injury and logistical constraints of studying surgical ergonomics. Future research must aim to develop objective monitors, ventilators and workstations to correlate ergonomics assessments with pain and tissue-level damage in operators. Ergonomics training should be developed to protect anesthesiologists and surgeons from preventable, potentially career-altering injuries.

As an example, two or more monitors should be present, which are adjustable in height to prevent neck discomfort. Special features of fibreoptic endoscopic instruments must have ergonomic position of the wrist and fingers to reduce muscle strain. A mismatch between table height and that of the anesthesiologist's height increases muscular strain; thus, an optimal operation table height should be pursued. A lack of balance can occur when using foot pedals, resulting in more muscle fatigue as the anesthesiologist may have to stand in awkward body positions, so a more neutral position should be considered. Lead aprons are heavy and cumbersome. Better materials and designs can improve on this. Glare from monitors and anesthesia equipments can be considerably reduced by better design and materials. Circulating space in operation theatres can be better planned to allow freedom of movement. (11)

5. Conclusion

The operating room (OR), in which anesthesiologists spend most of their time, is regarded as an unhealthy workplace due to the potential risks it offers. Most anesthesiologists do not know their professional risks and their occupational safety awareness level is insufficient. Awareness should be raised with regular training programs in order to overcome these shortcomings and working under safe conditions should be adopted as a professional culture. Control of occupational hazards to which anesthesiologists are exposed daily is necessary in order to develop an appropriate workplace and minimize risks to the good practice of anesthesiology. This contributes to decrease absenteeism, improve patients' care and quality of life of anesthesiologists.

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