Review Article

Occupational health related concerns among surgeons

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Abstract:

The surgeon's daily workload renders him/her susceptible to a variety of the common work-related illness. They are exposed to a number of occupational hazards in their professional work. These hazards include sharp injuries, blood borne pathogens, latex allergy, laser plumes, hazardous chemicals, anesthetic gases, equipment hazards, static postures, and job related stressors. However, many pay little attention to their health, and neither do they seek the appropriate help when necessary. It is observed that occupational hazards pose a huge risk to the personal well-being of surgeons. As such, the importance of early awareness and education alongside prompt intervention is duly emphasized. Therefore, increased attention to the health, economic, personal, and social implications of these injuries is essential for appropriate management and future prevention. These risks are as great as any other occupational hazards affecting surgeons today. The time has come to recognize and address them.

Key words: Surgeon, occupational hazards, occupational illness, work-related disease, occupational disease.

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Introduction

Medical practice, as with other professions, is associated with occupational hazards. [1, 2] Everyday healthcare workers are subjected to various occupational risks both physically and mentally. [3] Surgeons are not excluded from this group due to the nature of work carried out on a daily basis. [4] Over the last decade, there have been five million lost working days from self-reported work-related injuries and illnesses in the health and social care sector within the UK. [5] Furthermore, an estimated 100,000 new cases of work-related ill health have been reported which is significantly above the average in comparison to other industries. [6] In 2011/12, an estimated 1.1 million people in the UK suffered from an illness that was caused or made worse by their work. [7] A review of the literature revealed that while many before we addressed various aspects of harmful environmental effects on the surgeon, there is little data on the overview of these factors taken all together. Our intent, then, is to give a comprehensive presentation of the dangers lurking in the surgeon's milieu.

The population at risk

The risks and the consequences are varying on the basis of the various situations of the practice. The community of surgeons has some very specific characteristics differentiating them from fellow physicians and other human beings in general. Surgeons face many special environmental risks, to such an extent that we could almost consider ourselves as being exposed to a ``nosocomial disease.'' As with any other ``disease,'' there is a population at risk, causative agents, routes of transmission, signs and symptoms, resulting injuries and consequences, and prevention and treatment modalities. [8] Schwartz et al. [9] studied a group of physicians in an effort to define the surgical personality. Using three sets of inventories- the Krug adult personality inventory, the Strelau temperament inventory and Barclay's adjective checklist-and comparing surgeons to primary care physicians, they report that surgeons constitute a distinct and homogeneous group based on temperament and personality traits. It is also defined as the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people and people to their jobs. Although there are differences among subspecialties in surgery, we will discuss the entire surgical community as being the population at risk.

Surgeons commonly work with sharp instruments and complex equipment in performing procedures. This creates a lot of opportunities for them inadvertently nick their finger, hands, arm or wrist. Lifting or moving equipment also creates the possibility of accidents, or injuries to their arm, back or legs. [10, 11] Additionally, surgeons are in close quarters with patients, who may also have infectious illnesses or diseases. Surgeons cope best with stress and had the highest satisfaction among hospital consultants, and so are likely to be best protected from burnout and psychiatric morbidity. [12]

The causative agents

Because of the ubiquity of occupational hazards, injuries remain prevalent and expensive. Although occupational hazards can include musculoskeletal conditions, psychosocial stress, radiation exposure, and the risk of communicable diseases, sharps injuries remain the most common among surgeons in practice and the most frequent route of transmission of blood-borne pathogens. Surgeons in the UK are likely to be susceptible to stress, sharp injuries, burnout and psychiatric morbidities, substance abuse and musculoskeletal pain. [13, 14] We categorized these agents into accidental hazards, physical hazards, chemical hazards, biological hazards, ergonomic, psychosocial and organizational factors.

Accident hazards

Surgeons are at risk for injury in the operating room daily. It has been estimated that around 400,000 sharp injuries happen each year in the US, with around a quarter of these being sustained by surgeons. [15] With the amount of sharps that are used as an essential part of the operating room, it is perhaps no surprise that surgeons are considered to be the most at-risk staff members. A previous study conducted in 2007 among surgeons in training at the Addis Ababa University, department of surgery had revealed that work-related accidents, (needle sticks, blood splash to the face, contact of blood to

the skin and mucus membranes) among surgeons were enormous, and there was huge under reporting to the occupational health units. [16] Surgeons in operating room exposed to:

- Stabs and cuts from sharp objects, especially needle-sticks and cuts by the blades.
- Burns and scalds from hot water and steam used in sterilizing equipment, or from machines that supply hot air for the purpose of drying.
- Electrical shock from faulty or improperly grounded equipment, or equipment with faulty insulation.
- Acute back pain resulting from awkward body position during the operation.
- Noise-induced hearing loss.

The operating theatre environment was reported as the second most common setting for sharps injuries, after the wards, and surgeons were at a higher risk compared with their colleagues from other individual specialties. [11, 17, 18] A study of French surgeons estimated that the typical general surgeon experiences 0.8 injuries per 100 h of operating time, or 210 injuries throughout the course of a career, resulting in a 6.9% lifetime risk of contracting hepatitis C and a 0.15% lifetime risk of developing HIV. [19] Some studies also mentioned their perceived reasons of injury such as lack of appropriate operating equipments, lack of proper assistance during surgery and lack of the required surgical skills to conduct a safe procedure. Adherence to sharp safety policies was found to be poor, especially amongst consultants and senior surgeons who conversely were found to have higher rates of injuries from more time spent operating. [20] Moreover, the reasons cited included lack of time, excessive paperwork, unable to leave the surgical procedure/theatre list and inadequate support for reporting out of hours. [15]

Noise-induced hearing loss has been reported amongst orthopaedic surgeons due to the use of electric and air-powered drills and saws. In a single-centered, low-powered study, Willet demonstrated that the noise produced from a number of air powered and electric drills (90–100 dB) used in routine orthopaedic procedures exceeded the recommended daily personal exposure levels (85 dB). [21] Twenty-two senior orthopaedic personnel, consisting of 12 consultants, four senior registrars, one theatre nurse and five plaster technicians, were found to have noise-induced hearing loss on pure tone audiograms. These findings were corroborated by Siverdeen et al. who used sound-level meter measurements during various orthopaedic operations involving high-powered tools and showed that the noise levels in orthopaedic theatres can be at unacceptable levels. [22] The mean value of noise generated by saws was 95 dBA, whereas drills produced 90 dBA, K-wire drivers 85 dBA and hammers 65 dBA. The authors concluded that this could potentially lead to hearing problems in the staff and patients within the theatre environment. [21,22] Noise levels up to 118 dBA level that is potentially damaging to the hearing were measured in the operating room, notably during the use of high-speed gas turbine bone-cutting drills. Suction tips, which had trapped tissue "whistles" inside, yielded noise levels of up to 96 dB. Surgeons, staff, and patients should be cautioned against such noises and shielded in prolonged cases. [23]

Physical hazards

The hazards of exposure to ionizing radiation are well documented. [24,25] Surgeons exposed to scattered radiation while carrying out intra operative x-ray, fluoroscope and exposed to ionizing and non-ionizing radiation from laser based instruments, exposure frequency as reported by surgeons was 2.66. [26, 27] In orthopaedics, the hands of the operating surgeon receive the highest radiation exposure. [28] Although the hands of the surgeon are very close to the primary beam, the amount of radiation received during a specific operative procedure is almost unknown and little information is available on the long-term effects of radiation on tissues of high sensitivity, such as the eyes or the thyroid gland. [29] Fortunately, the hands are relatively insensitive to radiation with an annual extremity dose limit of 150 mSv for non-radiation workers. [30] Sanders et al. [25] observed that the mean radiation dose of the surgeon’s finger was 0.28 mSv in 21 IM nailing procedures with an average fluoroscopy time of 3.6 minutes. In another study it was ascertained that the average radiation dose to

the surgeon's hand was 0.07 mSv per case for each of the four IM nailing; the average duration of fluoroscopy being 2.9 minutes for the procedure. [31] Riley in his study also showed that with appropriate usage the radiation exposure from fluoroscopy is relatively low and the surgeon's hand receives the most exposure per case. The study demonstrated that maintenance and calibration of fluoroscopic machines are also important factors in reducing exposure risks. [32]

The use of X-ray imaging is an integral part of orthopaedic and trauma surgery. [33] The radiation to surgeons may be exposed includes both photonic radiation (x rays and y rays) and charged particle radiation (a and B rays). X rays are generated by conventional radio-diagnostic and x ray therapy equipment and by high energy x ray tubes. Gamma rays are produced by cobalt and caesium bombs and by radioelements encapsulated in needles, tubes, or pearls, which may also emit B rays.[34] Fears have been raised that occupational exposure to ionising radiation by surgeons may have detrimental effects on the future health of their unborn offspring. [35] It is generally accepted that exposure to ionising radiation can result in genetic damage and this may become manifest in the form of congenital abnormalities or childhood malignancies in the next generation. A number of recent studies have assessed the level of exposure to ionizing radiation by various health workers. Following reports from Sellafield and Hanford nuclear reprocessing plants which assert a significant association between the paternal occupational exposure to ionizing radiation and an increased incidence of leukaemias or congenital abnormalities in their children, fears have been raised that the children of orthopaedic surgeons may also be at risk. [36, 37] Finally, unencapsulated radioelements are used in solutions or colloidal suspensions administered to patients and laboratory animals or applied in radionuclear laboratories to biological material obtained from patients or animals. Exposure to scattered radiation released while carrying out x-rays and fluoroscopy during the operation (e.g. to urology surgeon from fluoroscopy). [34] Maitre et al. [38] conducted a retrospective cohort study in Grenoble amongst 936 physicians, surgeons, anaesthetists, radiologists and physicians working in labs and found that the incidence was the same as in the reference population. Haematological malignancies (e.g. leukaemia, lymphoma) were the only form of cancer that doctors were more likely to develop (standardized incidence ratio = 5.45, 95% confidence intervals 2–11.9).

Exposure to ionizing and non-ionizing radiation released from various instruments used during the patient's examination and treatment (e.g., lasers). Ophthalmology is unique in that its practitioners not only share the hazards and risks common to all surgeons, but also have their own occupational exposures, such as laser radiation. Laser equipment can cause severe burns, while it's possible that liquid can be spilled, which makes the area slippery and puts the risk of head injuries and falls at a much higher level. [39] However, there are certain measures, such as wearing the right protective clothing and shoes that can safeguard surgeons and other healthcare workers in theatre from these hazards. We also believe that a regular training focusing on awareness of radiation hazards and techniques of radiation protection is of paramount importance to keep radiation and scatter to a minimum. Thus radiation safety education program should included in hospital wide safety program also, film badge assessment and investigation program occupational which if implemented will make change in total risk percent up to 90%. Conducting same action will reduce ionizing and non ionizing radiation hazard score by 88.8%. [13, 34]

Work related musculoskeletal pain is one of the most important occupational health issues among surgeons. Musculoskeletal pain can be an occupational health problem for medical professionals, particularly surgeons and dental surgeons, who maintain static postures using precision hand and wrist movements. In one cross-sectional study, found the highest prevalence of musculoskeletal pain among dentists (61%), followed by surgeons (37%) and least in physicians (20%). They also found that the prevalence of musculoskeletal pain in physicians was comparable to that of the general population. More surgeons experienced musculoskeletal pain than physicians because of their standing position during surgeries (95%). Though 95% of times surgeons do their job in a standing position, they experience musculoskeletal pain in lesser

number than dentists, who perform their job in a standing position only 14% of the times. [40] This may be due to comfortable working conditions and better ergonomic postures during working. A nationwide postal questionnaire with 77 consultant surgeons from various disciplines found that 82% experienced pain while operating, with plastic surgeons having the most frequent episodes in a non-statistical comparison with general surgeons, otolaryngologists, orthopedics and neurosurgeons. [41] The study authors postulated that a possible explanation may be that the use of microscope, surgical loupes and head mounted lights, which were highlighted as the commonest contributing factors beyond posture, are frequently utilized in plastic surgical procedures. [42, 43, 44]

Overweight and obesity were found to be significant risk factors for musculoskeletal pain. Subjects with body mass index (BMI) >24.9 suffered from musculoskeletal pain 1.7 times more than subjects with BMI <24.9. [45] One difficulty in evaluating work related musculoskeletal pain is the inability to decide whether the pain is work related or age related or general health related or a combination of all these factors. Surgeons experienced low back pain higher than other hospital workers they involve in bending, awkward static posture during operation plus exposure psychological stress for a long time. In a national cross-sectional survey by Babar-Craig et al. of 325 ENT consultants, 72% had experienced either back or neck pain or both with most reports came from otologists, relating their symptoms to lengthy microscopic work and prolonged sitting. Fifty-three percent of respondents attributed their symptoms directly to previously performed ENT surgery. Other predisposing factors included static postures and bending during endoscopic procedures, similar to their general surgical colleagues. Eighty-three percent of these ENT surgeons had physiotherapy input with two requiring operative interventions. [46] In a study by Chatterjee et al., 54% ophthalmologists reported severe neck, back and leg pain with the longest serving consultants noted to be at increased risks. Although the number and duration of episodes increased with years spent in the specialty, they were unrelated to time spent operating. Most of the episodes were treated with analgesia although 49 ophthalmologists (28%) sought medical attention and nine required surgery. [47]

Chemical hazards

Although operation rooms in medical facilities are regarded as the cleanest environments because of surgical sterility requirements, surgical smoke produced by the use of electrocautery or laser systems is inevitable in modern surgery and potentially harmful to surgical personnel with long-term exposure. Allergy to topical medications and chemical agents in the working environment (such as detergents and disinfectants in the operating room or topical anesthetics and fluorescent agents at the examination table) could be a major distress for the surgeons and even may compromise their practices in some occasions. [48] Occupational exposure to anesthetic gases had a wide range of health effects, including neurological, renal and hepatic disease also reduction in mental performance and mental dexterity. [49] Surgeons are exposed to following common hazard:

- Inhalation of anesthetic gases (ethyl-ether, ethyl-bromide, ethyl-chloride, halothane, methoxyfluorane, nitrous-oxide).
- Inhalation of disinfectants (e.g. tri-cresol-phosphate, iodine, isopropyl-alcohol).
- Surgeons exposed to high risk of contact with iodine, isopropyle alcohol, tricreso and phosphate causing skin irritation and defecting. Formaldehyde exposure also associated nasopharyngeal tumors.
- Skin defatting, irritation, and dermatoses because of frequent use of soaps, detergents, disinfectants, etc.
- Irritation of the eyes, nose, and throat because of exposure to airborne aerosols containing washing and cleaning formulations (some of them alkaline), or to droplets of washing liquids.
- Latex allergy caused by exposure to natural latex gloves and other medical devices.
- Skin allergy caused by the powder inserted into the surgical gloves.

In the operating rooms, surgical smoke produced by electrocautery or laser applications during surgery emits tremendous amounts of particles and gases into the surrounding air. Surgical smoke, consisting of chemical gases and particles with various sizes, raises potential health concerns to surgical personnel in the long-term medical practice. In surgical smoke, contaminants such as hydrocarbons, phenols, nitriles, fatty acids, acrylonitrile, and carbon monoxide and viable cellular elements pose potential acute or long-term health hazards to the surgical staff. [50] Exposure to anesthetic gases also poses a risk for the pregnant orthopaedic surgeon because such agents potentially have an inhibitory effect on dividing cells. Exposure to these agents can increase the rate of formation of abnormal cells and the rate of chromosomal aberrations; however, this has not been demonstrated at doses used for general anesthesia. Moreover, sub-anesthetic levels have not exhibited fetotoxic effects. [51] Ethylene oxides used in sterilization carry risk of male infertility. [52] In open surgery, the heating process of electrocautery or laser applications for tissue dissection and vessel coagulation generates a noticeable noxious plume with an undesirable odor, and gaseous and aerosol emissions from the patient's surgical field. Electrocautery smoke contains various carcinogens and may pose unknown cancer risks for the nearly one million surgical staff around the world. The electrocautery smoke released during reduction mammoplasty was found to be mutagenic to the TA98 strain by the Ames tests. [53] Airborne particles have consistently been associated with adverse cardiovascular health outcomes. [54] Smoke evacuation in operation rooms has been strongly suggested to minimize exposure and related effects on health.

Reports of allergic contact dermatitis induced by proparacaine and proxymetacaine are some examples. [55] Common disorders included contact dermatitis, contact urticaria and infectious skin disease. [56] The frequently reported suspected agents were soaps and detergent, latex, personal protective equipment, wet work and sterilizing agents. Forrester et al. in 1998 reported that health care workers who washed their hands >35 times a shift were >4 times more likely to report occupational-related hand dermatitis in comparison to staff who washed less frequently. [57] These findings were corroborated by Callahan et al. in 2013 from Cleveland in the USA who found that hand washing >10 times a day was associated with a 1.55 incidence rate ratio of irritant hand dermatitis. [58] Latex gloves cause skin allergy to some surgeons and this can avoided easily by changing natural latex gloves to non-allergic synthetic ones but this may be add cost to hospital budget. [59]

Biological hazards

By virtue of their profession, surgeons and surgical residents have the greatest risk of exposure to blood-borne pathogens, given their numerous encounters involving the use of sharp instruments on patients and the increased propensity for injury while learning new technical skill sets. [60] The blood-borne pathogens that are most commonly involved in occupational transmission are hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV). [19] In surgery residents, the type of exposures are mainly needle stick injuries and cuts, and they tend to occur during operative procedures. Surgeons are exposed to following common hazard:

- Sharps injuries which occur during an operation may lead to infection.
- Infections due to the exposure to blood, body fluids or tissue specimens possibly leading to blood-borne diseases such as HIV, Hepatitis B and Hepatitis C.
- Surgeons using a CO_2 laser may become infected with HPV (human papilloma virus).

In the surgical team, surgeons sustain the highest risk of injury. [61] Assistant surgeons and surgeons-in-training are close behind. Other studies have also shown that among physicians and dentists, those in specialties with more frequent blood or needle-stick exposures (e.g., surgeons, obstetrician-gynaecologists, anaesthesiologists) have a significantly elevated risk compared to those in specialties such aspaediatrics or psychiatry. [60] Review of the literature shows that among healthcare workers, sero-prevalence for hepatitis B is two to four times higher than that of the general population. [62] In addition to needle-stick injuries or scalpel wounds, which

occur in 1.7–15% of operations, members of the operation room team are exposed to skin contamination from patients' blood in 6–50% of cases. Most of these injuries are self-inflicted and occur during suturing. Injuries are more common when procedures are complex, entail high blood loss, or involve multiple surgical teams and in a teaching environment. [63] With needle injuries, transmission of the infective agent can be expected in 10–30% of health-care workers if the patient is infected with hepatitis B, 1–10% with hepatitis C, and 0.1–0.3% with HIV. [64] Exposure to blood-borne pathogens is potentially serious occupational risk to pregnant female orthopaedic surgeons, who frequently handle sharp instruments, metal objects, and bone fragments during surgery. [64] Moreover, ophthalmologists are also exposed to needle-stick associated agents of HIV and hepatitis B virus. An additional risk factor for acquisition of HBV infection is the underlying prevalence of HBV infection in the population, which is very high in the developing countries. [19]

There are no logical arguments to support this behavior among surgeons. However, it is believed that part of the surgical culture has been maintaining the patient first at all cost, and when an accident occurs in the operating room, the surgeon's first inclination is to continue with the operation. Surgeons might be reluctant to report accidents for fear of being barred from further practices. Some authors have stated that one of the serious barriers to reporting include the time required to provide a medical history and blood sample to the employee health, to obtain informed consent from the patient and order the necessary tests, and to return for the recommended follow up visits. With an average of exposure of over six needle-stick injuries a year for the typical surgeon, and skin contamination by blood in nearly 50% of surgical procedures, busy surgeons do not take the time to comply. [19] After such repeated events of injury, it is possible that surgeons may become desensitized. Personal experiences with many surgeons (Verbal communication) have also shown that a significant number of surgeons and residents do not want to use prophylactic drugs against HIV when exposed to high risk blood because of its disturbing side effects. [64] The risk that a surgeon will acquire an active infection from an injury or exposure during an operation depends upon the severity of the injury, the type of needle involved (hollow-bore needles are more likely to transmit infection than solid needles), the rate of infection among the patient population, and the viral load of the patient's blood. [65] The risk can be reduced substantially by relatively simple prophylactic measures, including double gloving (which reduces the frequency of skin exposure to blood by more than 85% and reduces blood on the needle by 95%), immunization against hepatitis B, and post exposure vaccination and/or administration of immunoglobulin (for hepatitis B) or antiretroviral drugs (for HIV shortly after exposure). [62]

Surgeons generally comply poorly with these measures, except for hepatitis B immunization, which is now required by most hospitals. Double gloving is not widely accepted, as many surgeons believe it impairs sensation and dexterity. Neutral zone procedures to minimize handing sharp instruments back and forth during an operation are rarely adopted despite formal recommendations from the American College of Surgeons and other professional bodies. Exposure to HIV, HBV, and HCV infections has implications for personal relationships, future employment, and psychosocial well-being of the injured party. It also enables timely counseling regarding the risk of exposure and prevention of secondary transmission. It also allows medical evaluation, including testing and, if warranted, antiretroviral prophylaxis and therapy or administration of the HBV vaccine containing hepatitis B immune globulin. Antiretroviral therapy administered within 24 to 36 hours after exposure has been associated with an 81% reduction in HIV infection. [66] We believe such a low vaccination rate among our surgical residents may be due to various reasons including awareness, risk assessment, lack of opportunity and low priority given by the health managements of hospitals.

Ergonomic, psychosocial and organizational factors

The operating theatre itself can be a hazardous and stressful environment. [67] Surgeons have to constantly conduct complex procedures under time pressures within a setting plagued with distractions and interruptions while learning new technologies. [68] There is sufficient evidence that excessive

stress can impair a surgeon's hand-eye coordination while affecting their non-technical skills of teamwork and decision-making, highlighting the important effects of stress within the human factor in surgery. Ramirez et al. undertook a large survey to assess the mental health of UK hospital consultants. They reported a 27% prevalence of psychiatric morbidity among 882 respondents from five specialties: gastroenterology, radiology, surgical oncology, clinical oncology, and medical oncology. [69] Surgeons are most commonly exposed to:

- Mental stress and burnout stemming from the feeling of direct responsibility for the patients' health and as a result of death of patients.
- Stress, strained family relations, and burnout due to shift and night work, overtime work, and contact with sick patients, in particular accident victims and their relatives.
- Physical stress caused by excessive standing during the operation.
- Exposure to severely traumatized patients, multiple victims of a disaster or catastrophic event or severely violent patients may lead to post-traumatic stress syndrome.

Aging being a strong risk factor for psychological and emotional stresses would also have a contributory role in the initiation and aggravation of problems. [70] It has been suggested that the presence of depressive symptoms predicts future musculoskeletal disorders but not vice versa. A clear link is established between psychological variables with neck and back pain. Stress, fatigue, emotional distress or anxiety, sleep disturbances, cognitive dysfunction, poor quality-of-life and pain behavior were found to be significant factors involved in musculoskeletal disorders. The positive, in relation to the patient, aspects of using laparoscopic techniques unfortunately does not go hand in hand with the comfort of laparoscopic surgeon. The literature sources regarding ergonomics of laparoscopic procedures clearly indicate a problem with the static burden by surgeons. This problem applies to non-physiological position of the body during surgery which is more upright with fewer moves of back and a smaller range of motion than among surgeons performing open operations. [71] Characteristic factors are also uncomfortable, repetitive movements of the upper limbs as well as long-lasting static posture of the head. In most cases, when performing laparoscopic procedures, the surgeons adopt the standing position which entails the risk of loss of stability. In fact surgeons have limited ability to move their body weight. They must quite often do precise movements by hands while standing only on one leg and use their foot to operate the pedals of laparoscopic devices. [72] Insufficient knowledge in the area of ergonomics certainly contributes to perform forced and overloading musculoskeletal system body positions. However, it seems that this is not the main factor influencing this state of affairs. Operator surgeons intuitively try to organize surgical team work in such a way that the surgeon's body position was the most physiological. Therefore, the problem remains to lack of adjustment of the technical aspects of operations, such as: non-ergonomic surgical instruments, the lack of additional and/or mobile monitors, lack of auxiliary equipment such as ergonomic chairs or platforms supporting selected body segments of surgeon. [73] Moreover, an attempt of adjusting the working environment factors for leading surgeon has an impact on how to perform auxiliary activities by assisting doctors who are characterized by a high degree. [74]

In addition to the afore mentioned hazards, many occupational necessities and obligations, such as heavy workload and little free time, long-lasting training, costly instruments, early retirement, and the challenge of being up-to-date, could bring about psychosocial problems, such as insomnia, anxiety, depression, amnesia, and chronic headache, for all specialists.[75, 76, 77] Surgeons also facing stress in their family relation due to impact of loaded shifts and job stressors hazard exposure frequency were 1.833 + 1.169 and if employee social support program provide family support plus work shift adjustment total hazard score will decrease by 79%. Potential emotional stressors for any female surgeon include discrimination, lack of role models, role strain, and overload. [78] These stressors can lead to depression, suicide, and divorce, with the rates of suicide and divorce being greater among female surgeons than among the general

female public. [79] In a separate review by Tyssen et al. in 2007, the highest prevalence of alcohol abuse amongst the medical profession were found in female medical students, doctors under 40 and surgeons. [80] In critical or emergency situations, surgeons may have to deal with upset family members if surgery doesn't go well. [81] A national cross-sectional survey of 1308 hospital consultants found the incidence of mental health problems to be 32% with depression being the commonest illness. [3]

The risk of health workers becoming addicted to drugs arises because of the stress and anxiety to which they are subjected at times and because of the ready availability of suitable drugs. It is quite common for attempts to be made to overcome the pressures of overwork, stress, and affective strain by excessive resort to stimulants, whose use may alternate with excessive consumption of coffee or tobacco and the use of sleeping pills, alcohol, or other drugs. This was perceived to be a result of unpredictable workload, high patient attendances, limited resources and critical decision-making often based on incomplete information. [82] A postal questionnaire survey of 672 members of the Association of Surgeons of Great Britain and Ireland (ASGBI) in 1990 found that the major individual stressors were interference of job with personal life, general administration and number of patients seen in clinic. [4] A study from the Imperial College Healthcare group suggested that the operating theatre itself could be a hazardous and stressful environment. [76] Arora et al. highlighted that excessive stress intra-operatively could impair a surgeon's mental and technical ability. [76] They proposed that in an era of competence-based training, surgical trainees should be well equipped with effective coping strategies. In a study by Upton et al., one third of 342 surgeons surveyed reported high levels of burnout irrespective of their surgical specialty, age group, gender or surgical grade. [13] The incidence rates were consistent with a separate study of 501 colorectal and vascular surgeons where 32% reported high levels of job-related exhaustion. [14, 83] All surgical specialties showed similar rates of psychological morbidity with no association between number of hours worked, workload and level of burnout experienced. Palliative physicians, on the whole, reported less stress and more job satisfaction from a managerial and resource perspective in comparison to their colleagues from gastroenterology, radiology and surgery. [84, 85] Associated risk factors included feeling overloaded, dealing with treatment toxicity, low job satisfaction, inadequate resources and insufficient training in communication and management skills. A UK study of 144 doctors with substance misuse problems revealed that the mean age of referral was 43.1 years and substances abused were in the following proportions: 42% alcohol, 31% drugs and alcohol and 26% drugs solely. [86]

Conclusion

These hazards include sharp injuries, blood borne pathogens, latex allergy, laser plumes, hazardous chemicals, anesthetic gases, equipment hazards, static postures, and job related stressors. These hazards make it essential that all surgical professionals follow any established guidelines to reduce the risk of exposure and infection. Future studies should further validate the measure of hazardous attitudes among surgeons and determine if they are associated with preventable adverse events. While the study provides important base-line information concerning this important issue.

Competing interests

The author declares no competing interest.

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