

# Occupational Hazards for Surgeons

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**Background** In spite of the radical advances made in the field of surgery to save lives, we find it is the surgeons who are becoming the patients by being exposed to a host of occupational hazards, which places them at a significant risk of acquiring many infectious diseases in addition to other safety threats. In context to guidelines set down by International Labor Organization the hazards a surgeon can face at work can be broadly categorized into Accidental, Chemical, Biological, and Ergonomic, Psychosocial and Organizational Hazards. **Objectives** To identify the occupational hazards surgeons face in our set-up and their inevitable consequences as compared to international standards. **Setting** The survey was carried out in a major tertiary care hospital of Lahore with inspection of operation theatres, surgical emergency room, and surgical wards. **Results** The surgeons in our setup are exposed to infectious diseases such as Hepatitis B and C, HIV and typhoid via accidental pinpricks from infected needles and sharps due to multiple hazards. Other risks include latex sensitization, back problems, post-traumatic stress syndrome and many others. **Conclusion** Spread of awareness of these occupational hazards should be undertaken with a change in attitudes.

**Keywords** Occupational hazards, surgeon, infectious diseases, awareness.

Surgeons and other supporting staff that work in hospitals have committed themselves to a unique service program. This program does not work on fixed hours or for limited periods of the day, or for limited days of the week. Surgeons have frequently paid little attention to their own health and safety at work. They may thus be exposed to significant risks from the wide range of hazards prevalent in health-care. Risks to surgeons are underestimated and have serious consequences. Surgeons are exposed to these occupational hazards in the A & E, in the operation theatres and in the wards.

These occupational hazards are well documented and accessible; however we have observed that surgeons in our setup are still vulnerable to many diseases as a result of negligence. The aim of our study was to observe the extent of risk surgeons were at in the surgical units of a tertiary-care hospital and what measures can be taken to prevent them to make hospitals a safer place for surgical practice.

## Objectives:

- To identify all kinds of hazards surgeons are exposed to during practice of surgical procedures in the theatres and in the ward.
- The potential consequences a surgeon may face as a result of exposure to these hazards
- To observe and determine the awareness, attitudes and practices of surgeons

## Materials and methods:

This survey was conducted in one of the tertiary-care hospitals of Lahore. Surgeons and their practices were surveyed in the Accident and Emergency Unit including the Emergency Room, Minor Operation Theatre (O.T.), and the emergency O.T., the Elective O.T and the surgical wards. Surgeons exposed to, various hazards were categorized as in Table 1

Table 1: Hazards

Accidental hazards	Stabs and cut injuries, Burns and scalds, Electrical shock, Improper disposal of waste
Chemical Hazards	Inhalation of Anesthetic gases Skin defatting, irritation and dermatoses, Latex allergy, Skin Allergy
Biological Hazards	Spread of infections, Sharp injuries
Ergonomic, psychosocial and organizational hazards (EPO)	Mental stress, Physical stress Post-traumatic stress, Violence

## Results:

The hazards found, thus, their etiological factors and consequences were identified and are given in Table 2. It was seen that due to stab and cut there is increased risk of transmission of pathogens. Contact with patients secretion including blood, saliva, menstrual fluid, semen, urine, spinal fluid and ascitic fluid or improper waste disposal exposes the patient to various pathogens such as Hepatitis C, Hepatitis B, HIV, and Typhoid and even Tuberculosis in our set-up<sup>2, 3, 10, 15-17, 20-29, 32-34</sup>. Improper disposal of waste may also lead to falls and minor/major disabilities. Exposure to various chemicals like scrubs and disinfectants can lead to dermatoses. Latex gloves and the cornstarch powder used in them also present dermatological hazards associated with 3 pathological syndromes – irritant dermatitis, delayed (type IV) hypersensitivity reaction, resulting in a typical contact dermatitis, and the type I immediate hypersensitivity resulting in occupational asthma. A UK study reports 47.5% of 7,436 respondents stating they had skin rashes with latex Gloves<sup>9-14</sup>. Inhaling anesthetic gases in the O.T may have acute complications such as drowsiness, irritability, depression, headaches, and nausea with long-

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term consequences resulting in embryo-toxicity, liver and kidney disease<sup>6,7</sup>.

Surgeon is also at risk of mental stress due to fatigue resulting in decreased output, deterioration of physical and mental health, decreased social and family interaction

resulting in communication gap, post-traumatic stress syndrome and violent assaults. Physical stress can lead to backaches and varicose veins due to prolonged standing<sup>1,18,19</sup>

Table 2: Etiology of hazards

Accidental Hazards	Stabs and Cuts	<ul style="list-style-type: none"> <li>• Lack of personal protective equipment</li> <li>• Unavailability and inaccessibility of proper surgical kits and gloves</li> <li>• Pricks due to glove perforation</li> <li>• Poor Lighting</li> <li>• Old and worn-out instruments</li> <li>• Improper exchange of sharps</li> <li>• Lack of necessary information</li> </ul>
	Burns and Scalds	<ul style="list-style-type: none"> <li>• Hot water-sterilized instruments in emergency and elective OT.</li> <li>• Shortage of instruments</li> </ul>
	Electrical Burns	<ul style="list-style-type: none"> <li>• Faulty equipment</li> <li>• Improperly grounded equipment such as diathermy</li> </ul>
	Improper disposal Of waste	<ul style="list-style-type: none"> <li>• Slipperiness of fluid spillage and broken flooring</li> <li>• Risk of pin pricks</li> <li>• Falls due to improperly disposed gauze, etc, fluids and broken floors</li> </ul>
Chemical Hazards	Inhalation of anesthetic Gases	<ul style="list-style-type: none"> <li>• Poor work practices</li> <li>• Inadequate ventilation of OT</li> <li>• Improper maintenance of the machines</li> <li>• Exhalation after surgery</li> <li>• Old connections.</li> </ul>
	Skin defatting and dermatoses	<ul style="list-style-type: none"> <li>• Frequent use of soaps and disinfectants</li> <li>• Low quality disinfectants</li> </ul>
	Latex Allergy.	<ul style="list-style-type: none"> <li>• Natural latex gloves and other medical devices</li> <li>• Latex sensitization</li> </ul>
	Skin Allergy	<ul style="list-style-type: none"> <li>• Scrubs</li> <li>• Cornstarch powder in gloves</li> <li>• Re-utilization of Surgical gloves after boiling.</li> </ul>
Biological Hazards	Spread of infections	<ul style="list-style-type: none"> <li>• Exposure to blood, fluids, tissue specimens and excreta.</li> <li>• Lack of personal protective equipment</li> <li>• Unavailability of proper surgical kits</li> <li>• Absence of rubber-soled clogs</li> <li>• Blood splash in eyes due to unavailability of goggles</li> <li>• Changing wound dressing without gloves</li> </ul>
	Sharp injuries	<ul style="list-style-type: none"> <li>• Pin pricks while maintaining I/V line and administering injections</li> <li>• Glove perforation</li> <li>• Improper handling of sharps</li> <li>• Lack of proper surgical instruments</li> </ul>
Ergonomic Psycho-social and organizational hazards	Physical stress	<ul style="list-style-type: none"> <li>• Prolonged standing</li> <li>• Long shifts and overnight work</li> </ul>
	Mental stress	<ul style="list-style-type: none"> <li>• Feeling of direct accountability for the patient's health</li> <li>• Strained family relations</li> <li>• Lack of social life</li> <li>• Counseling or conveying news of deaths</li> <li>• Poor environmental factors for doctors</li> </ul>
	Post-traumatic stress	<ul style="list-style-type: none"> <li>• Exposure to severely traumatized patients</li> <li>• Contact with terminally ill patients</li> <li>• Multiple victims of Disaster</li> </ul>
	Violence	<ul style="list-style-type: none"> <li>• Volatile or irritable patients</li> <li>• Working when understaffed such as mealtimes or visiting hours</li> <li>• Long wait for service</li> <li>• Working alone</li> <li>• Patient transportation</li> <li>• Inadequate security</li> <li>• Unrestricted movement of public</li> <li>• Dealing with untrained and insubordinate staff</li> </ul>

### Discussion:

The various occupational hazards that a surgeon in our setup comes across can be categorized as accidental hazards, biological, physical, chemical and ergonomic, psychological and organizational hazards. Inspection of these risk factors was taken place in the emergency room, emergency and elective operation theatres, and in the ward.

It was observed that due to negligence on part of the surgeon and the lack of facilities provided, the surgeon is exposed to multiple hazards, which unfortunately most of us are unaware of. Most of the surgeons while managing a patient requiring immediate management expose themselves to biological hazards. Maintaining I/V line, and administering injections without using gloves is another mode of spread especially if it pricks the surgeon. These were found to be more rampant in the emergency room, especially in the Minor OT where there is a total disregard to standard surgical principles, with no surgical kits or other protective equipment and lack of trained staff for assistance in minor procedures. Changing wound dressings in the ward without proper gloves is also when a surgeon may come in contact with all these secretions.

Biological hazards<sup>15,19</sup> can be due to absence of *surgical kits* and rubber-soled clogs or shoe-coverings of any kind to protect from spilled body fluids and blood. There is no concept of using protective eyewear or shields in the operation theatre to protect from splashes or hazardous substances. Blood splashes at operation have been reported suggesting that Hepatitis B virus (HBV), Hepatitis C virus (HCV) and the Human Immunodeficiency Virus (HIV) can be transmitted by conjunctival contamination. The risk of eye splash injury in surgery is much greater than that perceived by most surgeons.

Due to reusing of gloves; glove perforations were found in 21.40%. During minor surgeries, the assistant was more likely to have exposure than the surgeon. During major surgery, the surgeon experienced more glove perforations (59.21%) than the assistant (40.79%). The most common location of perforations was the palmer face of the left hand in both groups.<sup>2, 3, 10-13</sup>

The improper disposal of waste can also lead to transmission of infections to the general population. Disposable syringes are considered to be at high risk among the other syringe technologies. This signifies the risk of blood-borne pathogen transmission from patient to surgeon. It is estimated that every year unsafe injections may infect 96,000 people with HIV and more than 21.7 million people with Hepatitis B, and two million with hepatitis C virus<sup>4, 5</sup>.

In the operation theatres the improper disposal of waste presents a different problem. Due to poor sanitation the surgeon is at an increase risk of falls. Discarded and contaminated gauze pieces, plastic wrappers and spillage of body fluids and water all contribute to accidents in the

form of falls. In addition, the broken and uneven flooring of an OT is an accidental hazard for surgeons and supporting staff. Insects in the operation theatres, mainly flies pose source of infection and a nuisance to the surgeon. It is as a result of poor ventilation and the improper disposal of waste.

Poor ventilation, inadequate work practices and faulty machinery are the main causative factors of exposure to the toxic effects of leaking anesthetic gases in the operation theatres which has also been observed in our set-up<sup>1</sup>. In addition to the above-mentioned risks a surgeon is exposed to in our hospital setup, we felt that the psychosocial aspect of occupational hazards was most neglected of all. The mental stress and burnout a surgeon goes through stems from the long working hours and feeling of direct accountability for the patients' health and the stress taken in foreseeing post-operative complications of a patient and the responsibility for the death of a patient. Contact with sick patients, in particular accident victims and their relatives; multiple victims of a disaster can be traumatic for the surgeon too. These all lead to post-traumatic stress syndrome<sup>1</sup>.

Dealing with severely violent patients can expose the surgeon to a lot of mental stress. Several studies indicate that violence often takes place during times of high activity and interaction with patients. Assaults may occur when service is denied, when a patient is involuntarily admitted, or when a surgeon attempts to set limits. These all point to organizational inadequacy in dealing with high influx of patients in the emergency, on the part of the administration and security, the lack of space to accommodate these patients and the general infrastructure of the emergency room, and also due to the low doctor-to-patient ratio<sup>1, 18, 19</sup>.

Lack of personal protective equipment such as *gloves* and assistance in the Minor OT leading to incidental needle stick injuries and lack of goggles leading to conjunctival contamination exposes the patient to infective pathogens such as HCV, HBsAg, HIV and even typhoid bacilli infection<sup>15</sup>. The transmission of *Salmonella Typhi* has been reported too. The true extent of the prevalence of these viral infections in healthy adults is unclear.

The volume of epidemiological data concerning hepatitis C is small compared with that concerning other infectious diseases such as AIDS and hepatitis B. In Pakistan, the prevalence of HCV is 6.7%. Incidence of HCV infected people in Pakistan 0.735%. And the incidence is 0.05%<sup>20-29</sup>. Seropositivity for HBsAg is significantly greater than anti HCV ( $p < 0.0001$ ), however the prevalence of Hepatitis B in Pakistan is lower than Hepatitis C (5.9%) due to greater awareness against HBV infection and availability of vaccine may have also contributed in slightly lower rate of CLD due to HBV infection in recent year<sup>17, 24, 29</sup>.

Prevalence of HIV in PAKISTAN 0.1%. Poor availability of epidemiological data precludes proper assessment of the HIV situation in Pakistan<sup>17, 26</sup>.

Tuberculosis remains an important occupational hazard. People have a 50 percent chance of becoming infected with TB if they spend eight hours a day for six months or 24 hours a day for two months working or living. Estimated 247,000 new cases arose in Pakistan 2000 (WHO Report, 2002). The overall prevalence of infection as judged by standard tuberculin test is 30%.

Worldwide typhoid fever affects about 6 million people with more than with more than 600,000 deaths a year. Almost 80% of cases and deaths are in Asia. There is also an incidence of invasion of salmonella species in gall bladder and the biliary tract in chronic carriers which results in excretion of bacteria in bile and feces for long time. Chronic carrier may excrete the bacilli for several years sometimes for as long as 50 years either continuously or intermittently. The famous case of "Typhoid Mary" who gave rise to more than 1300 cases in her lifetime is a good example of a chronic carrier. The prevalence of typhoid fever in Pakistan is estimated to be 0.7%.

### Conclusion:

To tackle the above-mentioned hazards a surgeon is exposed to it is important to recognize the problem at first and spread awareness. The areas which need work the most are the availability or lack thereof of facilities provided to the surgeon in our set-up, including personal protective equipment and instruments and environmental factors. There should be adequate funds with proper utilization of these on facilities with no compromise on quality. Any misuse of amenities or misconduct as far as where surgical principles are concerned should be dealt with efficiently. The personal attitude of a surgeon and his/her awareness concerning occupational hazards should be given serious thought and action with accountability from higher authorities. Proper training programs for nursing staff and junior surgeons should be implemented to avoid inevitable hazards from poor assistance.

### References:

1. International Hazards Datasheet on Occupation for Surgeons. ILO/CIS program., ILO Encyclopedia of Occupational Health and Safety, 4<sup>th</sup> Ed., ILO, Geneva, 1998
2. Marcus Vinicius Jardim Barbosa Risk of Glove Perforation in Minor and Major Plastic Surgery Procedures Aesthetic Plastic Surgery)
3. Maher O. Osman <sup>Al</sup> and Steen L. Jensen Surgical Gloves: Current Problems World Journal of Surgery)
4. World Health Organization. Injection Safety fact sheet No. 231. Geneva, WHO, 2002.
5. U.S. Department of Labor, Occupational Safety and Health Administration. 1991. Occupational Exposure to Blood borne Pathogens Standard. 29 CFR 1910.1030.
6. Occupational Safety and Health Administration (OSHA). 1987. *Chemical Information Manual*. U.S. Government Printing Office: Washington, DC.
7. National Institute for Occupational Safety and Health (NIOSH). 1977. *Criteria for a Recommended Standard: Occupational Exposure to Waste Anesthetic Gases and Vapors*. DHEW: NIOSH Publication No. 77-140. NIOSH: Cincinnati, OH.
8. Occupational Safety and Health Administration (OSHA). 1987. *Chemical Information Manual*. U.S. Government Printing Office: Washington, DC
9. Barbara J. Santais MC, Levy DA, Ruff F, Leynadier F. Immunoadjuvant properties of glove cornstarch powder in latex-induced hypersensitivity. Clin Exp Allergy. 2003 Jan; 33(1):106-12.
10. Maher O. Osman <sup>Al</sup> and Steen L. Jensen Surgical Gloves: Current Problems World Journal of Surgery
11. Welsh Office Health Department Latex Medical Gloves (Surgeons' and Examination) Powdered Latex Medical Gloves (Surgeons' and Examination) WO SAB(98)25, June 1998
12. Ahmed DD, Sobczak SC, Yunginger JW: Occupational allergies caused by latex. Immunol Allergy Clin North Am 2003 May; 23(2): 205-19
13. Agarwal S, Gawkrödger DJ: Latex allergy: a health care problem of epidemic proportions. Eur J Dermatol 2002 Jul-Aug; 12(4): 311-5.
14. Huynh, Nghi T; Commens, Christopher A. Scrubbing for cutaneous procedures can be hazardous. Australasian Journal of Dermatology. 43(2):102-104, May 2002.
15. Brearley S, Buist LJ. Blood splashes: an underestimated hazard to surgeons. BMJ 1989;299:1315
16. Patterson, W. et al. 1985. *Occupational Hazards to Hospital Personnel*. Annals of Internal Medicine. 102:658-680.
17. Occupational Safety and Health Administration (OSHA). 1989. *Enforcement Procedures for Occupational Exposure to Hepatitis B Virus (HBV) and Human Immunodeficiency Virus (HIV)*. OSHA: Washington, DC
18. Chaff, L.F. 1989. *Safety Guide for Healthcare Institutions*. 4th ed. American Hospital Publishing: Chicago
19. Charney, W. and Schirmer, J. 1990. *Essentials of Modern Hospital Safety*. Lewis Publishers, Inc.: Chelsea, MI.
20. (Parker SP, Khan HI, Cubitt WD. Detection of antibodies to hepatitis C in dried blood spot samples from mothers and their offspring in Lahore, Pakistan. J Clin Microbiol 1999;37:2061-3.
21. Morbidity and Mortality Weekly Report. Recommendations for prevention and control of hepatitis C virus (HCV) and infection and HCV-related chronic disease. MMWR 1998;47:No. RR-19.
22. Hayashi J, Kishihara Y, Yamaji K, Yoshimura E, Kawakami Y, Akazawa K, et al. Transmission of HCV by health care workers in a rural area of Japan. Am J Gastroenterol 1995;9:794-9
23. S. Rana, MD; A.R. Khan, MD; A.A. Haleem, MBBS; F.N. Khan, MD; A. Gul, MD; A.R. Sarwari, MD Hepatitis C: Knowledge, Attitudes and Practices among Orthopedic trainee surgeons in Pakistan
24. Zuberi S.J., Seroepidemiology of HBV/HBC in Pakistan. Int Hepatol Comm. 1996;5:19-26.
25. Allander, T., A. Gruber, M. Naghavi, A. Beyene, T. Soderstrom, M. Bjorkholm, L. Grillner, and M. A. Persson. 1995. Frequent patient-to-patient transmission of hepatitis C virus in a hematology ward. Lancet 345:603-607
26. Abel, S., R. Cesaire, D. Cales-Quist, O. Bera, G. Sobesky, and A. Cabie. 2000. Occupational transmission of human immunodeficiency virus and hepatitis C virus after a punch. Clin. Infect. Dis. 31:1494-1495.
27. Dusheiko, G. M., M. Smith, and P. J. Scheuer. 1990. HCV transmitted by human bite. Lancet 336:503-504
28. Liou, T. C., T. T. Chang, K. C. Young, X. Z. Lin, C. Y. Lin, and H. L. Wu. 1992. Detection of HCV RNA in saliva, urine, seminal fluid, and ascites. J. Med. Virol. 37:197-202.
29. Malik IA., Tariq WVZ, Viral hepatitis in Pakistan (Editorial) PJP 1993;4:15-18.