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Minimization of Microbial Infection Risk from Surgery

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Dear Editor,

Great advancement has been made during the last decades in surgical techniques and technologies in different fields [1,2]. However, all share the same basic crucial requirements of good practices activities, collectively could be referred to as GXP (i.e. all activities are performed as good practice). Aseptic procedures during surgeries are important for any successful operations not only for correct recovery of patients but also for their lives [3]. Strict following of GXP standard rules are mandatory to minimize the risk of infection of patients from microbial intrusion into normally sterile body cavities during invasive procedures [4].

Infections associated with surgery are usually developed within 30 days after surgery and called Surgical Site Infection (SSI), Center for Disease Control and Prevention (CDC) classified SSI into three types: superficial, deep, organ or body space [5]. According to National Nosocomial Infections Surveillance (NNIS), the rate of SSI is 2 % from total monitored surgeries in the USA during 2002 but accounts for 20 % from the whole number of infections that are associated with healthcare [6]. Most SSI cases are associated with endogenous microorganisms notably those from skin flora such as Staphylococcus aureus or enteric Gram-negative bacteria if surgical operations are related to the gastrointestinal tract (GIT). However, some infections are exogenous which are related to hospital surrounding environment during surgery which include staff members, air, surfaces, tools and instruments [6].

Several factors may contribute to the increase of infection risk from surgery such as contaminated medical devices and tools in addition to the medical and health condition(s) of the affected patient such as elderly, diabetes, autoimmune disease and obesity. Also, the condition state at which the surgical operation was performed such as emergency surgical procedures where the condition is critical and the operation may run in improperly prepared environment. Moreover, type and magnitude of infection from the surgical operation may be detrimental to the patient health and even the life [7]. Fig. 1 demonstrates the relative abundance of bacteria in the operation theaters in different private and public hospitals [8]. According to this study, Gram-positive bacteria contributes by 48.44 % from the total contamination observed in this survey with *Staphylococcus* being the most frequently isolated and identified in the samples. Human microorganisms are the most prominent source of microbial contamination in the operation room in the hospital facilities.

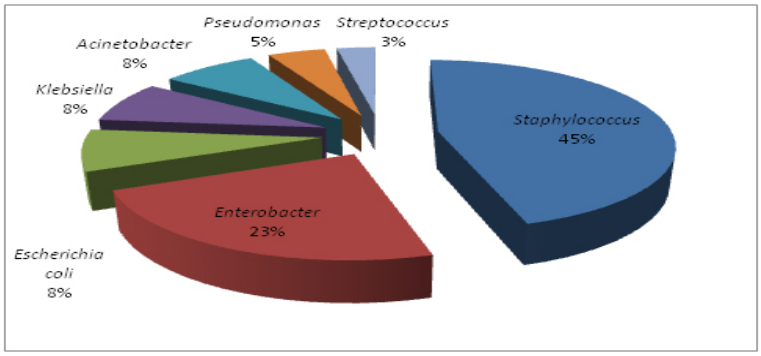

Fig1. *Microorganisms distribution in operation rooms at different hospitals [8].*

Working on the sources of microbial intrusion into the surgical injury of the patient that cause SSI provides a direct strategy to minimize the risk associated with this type of infections. Fig. 2 shows the common sources of microbial transfer to the surgical wound. Endogenous SSI could be minimized by using appropriate antimicrobial agents before surgery, such as antiseptics for skin area that will be subjected for incision for medical operation using certimide, chlorhexidine, alcohols or iodine/iodophors and preoperative control of bowel bacteria (sterilization) such as neomycin. In addition, prophylactic antibiotics may be administered prior to the surgical operations to reduce the possibility of infections [9 - 12].

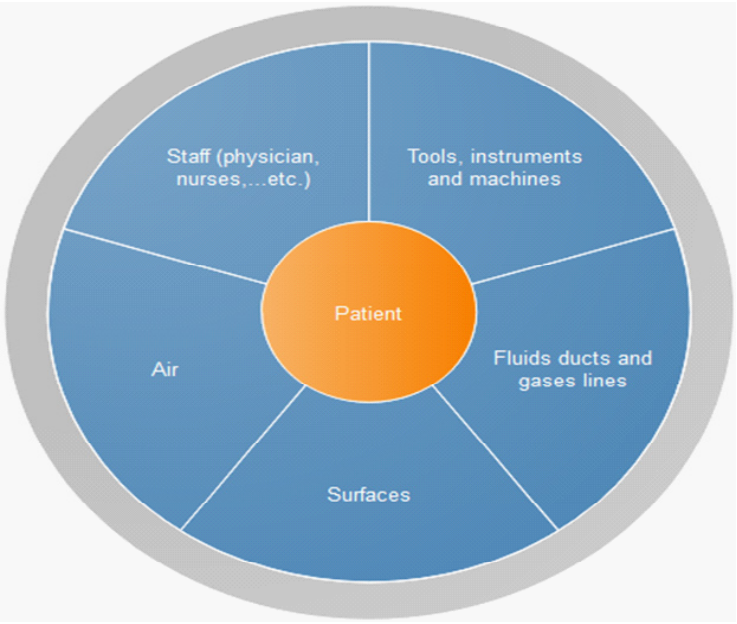

Fig2. *Possible routes of SSI (orange section is endogenous source and blue sectors are exogenous microbial reservoir)*

On the other hand, exogenous sources of infections which may originate from different pathways could be truncated using appropriate techniques and methods for each one. Transfer of microbial contamination through working staff members of healthcare facilities are major contributors of microbial infection [13, 14]. Thus appropriate GXP protocols should be established and strictly implemented that ensure appropriate activities which maintain an aseptic environment and prevent microbial contamination which may infect surgery site either directly or indirectly. Quality of air in the surgery theater and its flow is another item that should be considered in controlling SSI [15]. Air sterilization and treatment should be ensured through appropriate maintenance of air handling units (AHUs) in the facility.

Gas lines and the ducts for the fluids that are present in the room during surgery may be another factor that should be considered to be controlled to minimize microbial contamination and transfer to the patient [16]. Nature of the surfaces is also a crucial factor in limiting microbial spreading such as smoothness, antimicrobial components of the lining, impervious to water, round edges and corners to facilitate cleaning and sanitization [17]. Tools, instruments and machines that are used in surgery should be subjected to a suitable sterilization procedure prior to the operation and the sterile items must remain physically protected from contamination when in an idle state. Sterilization procedures and instruments that depend on either using chemical or physical techniques should be validated periodically to ensure the validity of the process of delivering items with appropriate sterility assurance level (SAL) [18, 19].

Under any circumstances, the correct implementation of preventive measures against SSI starts with the design of surgical operation area that takes into consideration of personnel and materials in/out the surgical theatre room. Validation of sanitizers and disinfectants on regular basis is recommended against a different spectrum of periodically isolated and identified microbes in the hospital environment to ensure their effectiveness and ability to control bioburden levels. Perception of the aseptic technique

and procedure importance should be regularly disseminated among the hospital staff to support self-commitment attitude among healthcare professionals. Complementarily, effective training, assessment programs coupled with motivational leadership management and control are essential to invest in the improvement of the human factor capabilities which is considered the main source of microbial contamination spreading through the healthcare facility.

References

[1] Riskin DJ, Longaker MT, Gertner M, Krummel TM. Innovation in surgery: a historical perspective. Annals of surgery. 2006 Nov; 244(5): 686.

[2] 10 Biggest Technological Advancements for Healthcare in the Last Decade [Internet]. Beckershospitalreview.com. 2014 [cited 17 November 2018]. Available from: https://www.beckershospitalreview.com/healthcare-information-technology/10-biggest-technological-advancements-for-healthcare-in-the-last-decade.html

[3] Stephens C. Aseptic Technique: Uses, Benefits, and Complications [Internet]. Healthline. 2017 [cited 21 November 2018]. Available from: https://www.healthline.com/health/aseptic-technique

[4] Clayton J, Miller K. Professional and Regulatory Infection Control Guidelines: Collaboration to Promote Patient Safety. AORN Journal. 2017; 106(3): 201-210.

[5] What You Should Know About Surgical Site Infections [Internet]. Hopkinsmedicine.org. 2018 [cited 21 November 2018]. Available from: https://www.hopkinsmedicine.org/healthlibrary/conditions/surgical_care/surgical_site_infections_134,144

[6] Darouiche R. Surgical site infections [Internet]. Infectious Disease Advisor. 2018 [cited 21 November 2018]. Available from: https://www.infectiousdiseaseadvisor.com/hospital-infection-control/surgical-site-infections/article/598857/

[7] Torpy J. Postoperative Infections. JAMA. 2010; 303 (24): 2544.

[8] Al Laham NA. Prevalence of bacterial contamination in general operating theaters in selected hospitals in the Gaza Strip, Palestine. Journal of infection and public health. 2012 Feb 1;5(1):43-51.

[9] Edwards P, Lipp A, Holmes A. Preoperative skin antiseptics for preventing surgical wound infections after clean surgery. Cochrane Database of Systematic Reviews. 2004(3).

[10] Wenzel R. Preoperative Antibiotic Prophylaxis. New England Journal of Medicine. 1992; 326(5): 337-339.

[11] Predescu R, Rotaru D, Boghean P, Panti Z, Nica M, Popa M, Ene D, Cîrstoiu M, Ene R, Cîrstoiu C. ADVANTAGES OF TRABECULAR METAL IN REVISION HIP ARTHROPLASTY. Journal of Surgical Sciences Vol. 2017 Oct; 4(4).

[12] Drugs & Medications [Internet]. Webmd.com. 2018 [cited 22 November 2018]. Available from: https://www.webmd.com/drugs/2/drug-8047/neomycin-oral/details

[13] Ducel G, Fabry J, Nicolle L. Prevention of hospital acquired infections: a practical guide. Prevention of hospital acquired infections: a practical guide. 2002(Ed. 2).

[14] Chemaly RF, Simmons S, Dale Jr C, Ghantoji SS, Rodriguez M, Gubb J, Stachowiak J, Stibich M. The role of the healthcare environment in the spread of multidrug-resistant organisms: update on current best practices for containment. Therapeutic advances in infectious disease. 2014 Jun; 2(3-4):79-90.

[15] Balocco C, Petrone G, Cammarata G, Vitali P, Albertini R, Pasquarella C. Indoor Air Quality in a Real Operating Theatre under Effective Use Conditions. Journal of Biomedical Science and Engineering. 2014 Aug 25;7(11):866.

[16] Asepsis and Aseptic Practices in the Operating Room [Internet]. Infection Control Today. 2000 [cited 22 November 2018]. Available from: https://www.infectioncontroltoday.com/hand-hygiene/asepsis-and-aseptic-practices-operating-room

[17] Spagnolo AM, Ottria G, Amicizia D, Perdelli F, Cristina ML. Operating theatre quality and prevention of surgical site infections. Journal of preventive medicine and hygiene. 2013 Sep; 54(3): 131.

[18] Srun SW, Nissen BJ, Bryans TD, Bonjean M. Medical device SALs and surgical site infections: a mathematical model. Biomedical instrumentation & technology. 2012 May; 46(3): 230-7.

[19] Samsell BB, Moore M, Bertasi G, Spinato S, Bernardello F, Rebaudi A, Sfasciotti GL, Powers R. Are Bone Allografts Safe and Effective for Today's Dental Practitioner?. Dentistry. 2014 Jan 1; 4(9):1.

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