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Essentials of Regulating Operating Room Safety by Overcoming the Hazardous Effects of Surgical Smoke

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Medical professionals and surgeons are adversely affected by prolonged exposure to surgical smoke generated by energy devices in operating rooms (OR). Chronic exposure to these carcinogens can cause headaches, dizziness, watery eyes, and other health problems. Energy devices are increasingly being used in hospitals' state-of-the-art operating rooms, posing a surgical smoke threat. To ensure a safe and smoke-free working environment for medical professionals, it is essential to comprehend the risks associated with surgical smoke. Dr Mok Chi Wei, Consultant at the Department of Surgery, in Singapore's Changi General Hospital discusses the potential risk of surgical smoke to OR staff and how it can be mitigated.

- **How do you determine the hazardous implications of surgical smoke and what are the current procedures in practice?**

Surgical smoke, generated by energy devices, contains numerous harmful compounds that may negatively affect Operating Room (OR) personnel in the long run. Studies indicate that surgical smoke comprises 80 potentially hazardous chemicals,

blood and tissue particles, as well as bacteria and viruses Many of these compounds are present at levels exceeding the acute exposure limits recommended by national health organisations. Prolonged exposure to these carcinogens can cause headaches, dizziness, watery eyes and other long-term health complications.

In modern operating rooms, energy devices are increasingly used, increasing the risk of surgical smoke exposure. It is crucial to comprehend the hazards associated with surgical smoke and take action to minimise them, ensuring a safe and smoke-free work environment for healthcare professionals.

Recently, leading surgeons from Singapore, Hong Kong, India, and the United States participated in an Asia Pacific smoke ambassador expert panel discussion. Being one of the panellists, our consensus was that surgical staff can be negatively affected by three critical factors: 'Air quality in the OR'; 'Type of surgical approach' (open, laparoscopic robotic surgery), and "Duration of exposure". The World Health Organisation recommends a limit of five times less smoke from laser procedures than from conventional procedures. These factors should be taken into account by perioperative staff when modifying their techniques. In order to minimise surgical smoke, smoke evacuation systems can be used in both open and minimally invasive surgeries.

- **In order to achieve a smoke-free operating room, what are the recommendations?**

The healthcare industry can concentrate on three primary areas to reduce surgical smoke exposure: The first area of focus is engineering controls, which play a key role in reducing the risk of surgical smoke. Utilising local exhaust ventilation (LEV) has been demonstrated to reduce airborne particles and volatile organic compounds, ultimately decreasing surgical smoke exposure. Additionally, operating rooms should consider installing general room ventilation and air filtration systems with integrated high-efficiency particulate air (HEPA) filters. The recommended approach is for operating rooms to implement a tailored combination of LEV and general room ventilation to minimise surgical smoke exposure. Study results show that less than half of medical facilities surveyed currently employ adequate engineering controls to combat surgical smoke exposure. Standardising engineering controls in operating rooms is urgently needed.

Secondly, enforcing adequate work practice controls and an effective smoke management system is critical in mitigating the risks associated with surgical smoke. It is recommended that hospitals establish policies regarding surgical attire to protect OR personnel from surgical smoke. For respiratory protection, well-fitted respirators like the N95 are more effective than surgical masks or laser masks. To eliminate surgical smoke, high-efficiency smoke evacuation systems should be installed near the source of the smoke.

Finally, hospitals should enforce stringent administrative controls to minimise surgical smoke exposure. It is the shared responsibility of hospital administrators, nursing staff, operating surgeons and others to ensure the effective implementation and compliance of smoke-free measures. The OR personnel should also be involved in developing and reviewing the policies. Perioperative staff should also be trained on the risks and preventive measures associated with surgical smoke, and policies should be periodically reviewed for relevance and effectiveness.

- **In Asia, how are policy and regulatory standards designed to mitigate the harmful impact of surgical smoke?**

Although regulatory agencies have acknowledged the hazards of surgical smoke, there are no definitive standards and guidelines specific to the Asia Pacific (APAC) region addressing the mitigation of surgical smoke exposure in the OR environment. National regulatory bodies, such as the National Accreditation Board for Hospitals & Healthcare Providers (NABH) in India, have issued recommendations and guidelines, but there are no strict policies in place to ensure compliance. To protect both perioperative staff and patients in the OR, national policies on surgical smoke safety should be implemented, and integrated into existing safety guidelines in healthcare facilities.

Further, there is no APAC consensus surrounding the risks associated with surgical smoke, or studies investigating the long-term effects. In order to establish a more accurate framework for OR safety in the region, more research and evidence are needed around surgical smoke exposure.

- **What are the impacts of OR safety tools and devices on the medical device market? Are awareness campaigns making a difference in the device market?**

OR safety tools are effective in improving safety during surgery and eliminating surgical smoke. Commonly used tools may not be as effective in achieving the same results. For example, wall suctions cannot remove smoke directly at the source, increasing the potential for exposure. Similarly, while surgical masks provide essential respiratory protection, they may not filter out all substances present in surgical smoke.

Advancements in smoke evacuation devices have been designed to address the growing use of energy devices and the accompanying surgical smoke emission. Healthcare professionals can now find a variety of smoke evacuators suitable for various surgical approaches, from open to laparoscopic, which help to effectively minimise surgical smoke at the source. One example is Ethicon's MEGADYNE portfolio of smoke evacuators, which are designed to be both efficient and quiet.

Awareness campaigns have successfully highlighted the potential dangers of surgical smoke and encouraged healthcare professionals to prioritise the safety of both OR personnel and patients during surgery.For instance, Ethicon’s OR safety campaign sparked discussions around surgical smoke exposure and also brought to light new evidence and guidelines around related hazards.

Increasing awareness of surgical smoke has encouraged nurses and OR assistants to maintain the smoke evacuation systems, allowing us to work in a smoke-free and safe environment. OR safety requires a collective effort by everyone.

- **How do you foresee the smoke evacuation system market trends and potentials? What are the growth drivers in 2023?**

In the wake of a three-year pandemic, the safety of patients and perioperative staff has taken centre stage in the industry. This period has highlighted the importance of providing a safe environment for both patients and healthcare professionals, which includes OR safety.

As awareness of the dangers of surgical smoke and the importance of OR safety grows across the APAC region, I believe we are making progress towards integrating effective smoke evacuation systems and comprehensive standards in hospitals in the region. Smoke evacuators remain an essential device for removing smoke directly at the source. With different filtration levels and designs for various types of surgery, hospitals can deploy the appropriate device depending on the surgical approach. An effective smoke evacuation system can ensure minimal surgical smoke exposure, and I anticipate it becoming an integral component of every operating room over the next few years.

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