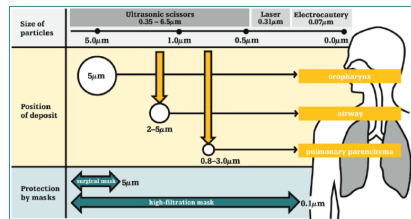


# Surgical Smoke: The Forgotten Biohazard

## What is Surgical Smoke?

- By-product of the thermal destruction of tissue by heat producing electrosurgical devices used to cut and coagulate tissue<sup>1</sup>
- 95% water vapor and 5% particulates<sup>4</sup>
- Contains over 40 known carcinogens<sup>1,3,4,5</sup>
- Contains blood and tissue particles, live bacteria and viruses (HPV, HIV, Hepatitis B), viable malignant cells<sup>1,3,4,5</sup>
- Surgical smoke is mutagenic, cytotoxic, genotoxic, carcinogenic and no safe level of exposure exists<sup>1,2,3,4,8</sup>

## Surgical Smoke Particle Size



- Due to particle size of surgical smoke, high filtration (N95) masks are important but not sufficient<sup>4</sup>

## Health Effects to Staff & Patients

- A single day working in the OR is potentially equivalent to smoking 27-30 unfiltered cigarettes a day<sup>9</sup>
- Surgical staff suffer twice the adverse health respiratory affects than the general public<sup>5</sup>

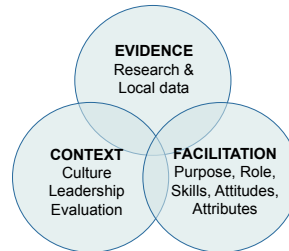
### Health Risks of Surgical Smoke<sup>5</sup>

Respiratory System	Nasopharyngeal lesions, nasal congestion, rhinitis, sneezing, cough, sore throat, burning throat, emphysema, asthma, bronchitis, pneumonia, alterations in nasal mucosa
Eyes	Eye irritation, watery eyes, eye infections
GI system	Nausea, vomiting
Infection	HPV, hepatitis, HIV
Skin	Skin irritation and dermatitis
Other	Dizziness, headaches, weakness, lightheadedness, hypoxia, carcinomas, in-vitro mutations

- Laparoscopic surgery patients absorb smoke through the peritoneal membrane which can cause postop hypoxia, vertigo, nausea, headache, and weakness<sup>3</sup>
- Smoke hinders the surgeons field of view putting patients at risk for negative outcomes<sup>5</sup>

## Framework

To enhance and optimize efforts of research and promote change the PARIHS framework model was utilized



## Key Concepts & Outcomes

- Increase the knowledge and awareness of the hazards of surgical smoke in the perioperative environment and prioritize evacuating surgical smoke during every procedure to:
  - protect staff from exposure to surgical smoke
  - prevent surgery complications
  - promote safer patient outcomes
- Develop an evidenced-based surgical smoke evacuation policy that includes the use of a local smoke evacuator within two inches of smoke source to reduce the presence of surgical smoke in the OR by Oct. 2023 and reach a 75% compliance by Oct. 2024

## Interventions & Solutions

### INDIVIDUAL

- Staff safety education on the need for proper PPE when surgical smoke is present<sup>4</sup>

### UNIT

- Educate staff using a multi-modal approach to the hazards of surgical smoke<sup>10</sup>
- Hands-on training and trails for different smoke evacuation devices<sup>10</sup>

### POLICY

- Develop a unit smoke evacuation policy<sup>10</sup>
- Changes to EHR documentation for auditing purposes<sup>11</sup>
- Advocate for state surgical smoke evacuation law<sup>9</sup>

## Key Players

- Patients undergoing surgery
- Nurse Leaders
- Nurse Educator
- Unit Director & Manager
- Surgeons
- RN Circulators
- Surgical Technicians
- Auxiliary surgery staff
- Association of periOperative Registered Nurses
- American College of Surgeons
- Occupational Safety and Health Administration
- National Institute for Occupational Safety and Health

## Evaluation

### PROCESS EVALUATIONS

- Monitor policy compliance through direct observation of surgical smoke evacuation device use<sup>11</sup>
- Conduct chart audits of nursing documentation to track policy compliance<sup>10</sup>

### IMPACT EVALUATIONS

- Feedback survey and suggestions from staff on the effectiveness of education and improving policy compliance<sup>10</sup>
- Pre & Post education surveys<sup>10</sup>
- Monitor employee sick days / incidences of health problems associated with surgical smoke exposure

Julie N. Wooldridge, RN  
RN-BSN Student

Cal Poly  
**Humboldt.**

## References

1. Addley, S., & Quinn, D. (2019). Surgical smoke – what are the risks? *The Obstetrician & Gynaecologist*, 21(2), 102–106. <https://doi.org/10.1111/rog.12552>
2. Bullerman, B. (2020). *Quick-safety-56-surgical-smoke-final-12-9-20* [PDF]. The joint commission <https://www.jointcommission.org/-/media/tic/newsletters/quick-safety-56-surgical-smoke-final-12-9-20.pdf>
3. Canicoba, A., & Poveda, V. (2022). Surgical smoke and biological symptoms in healthcare professionals and patients: A systematic review. *Journal of PerAnesthesia Nursing*, 37(1), 130–136. <https://doi.org/10.1016/j.jopan.2021.06.106>
4. Katoch, S., & Mysore, V. (2019). Surgical smoke in dermatology: Its hazards and management. *Journal of Cutaneous and Aesthetic Surgery*, 12(1), 1–7. <https://doi.org/10.4103/jcas.sas.177.18>
5. Liu, Y., Song, Y., Hu, X., Yan, L., & Zhu, X. (2019). Awareness of surgical smoke hazards and enhancement of surgical smoke prevention among the gynecologists. *Journal of Cancer*, 10(12), 2788–2799. <https://doi.org/10.7150/jca.31464>
6. Dobrogowski, M., Wesolowski, W., Kucharska, M., Sapota, A., & Pomorski, L. (2014). Chemical composition of surgical smoke formed in the abdominal cavity during laparoscopic cholecystectomy – assessment of the risk to the patient. *International Journal of Occupational Medicine and Environmental Health*, 27(2). <https://doi.org/10.2478/s13382-014-0250-3>
7. [Particle Size Image]. (2018). Stryker. <https://www.smokefreeoperatingroom.com/health-risks-associated-with-exposure-to-surgical-smoke-for-surgeons-and-operations-room-personnel/>
8. Steege, A. L., Botano, J. M., & Sweeney, M. H. (2016). Secondhand smoke in the operating room? precautionary practices lacking for surgical smoke. *American Journal of Industrial Medicine*, 59(11), 1020–1031. <https://doi.org/10.1002/ajim.22614>
9. Vortman, R., & Thornton, J. (2021). Empowering nurse executives to advocate for surgical smoke-free operating rooms. *Nurse Leader*, 19(5), 508–515. <https://doi.org/10.1016/j.nl.2020.10.004>
10. Charvis, S., Wagner, V., Becker, M., Bowerman, M. I., & Jamias, M. (2016). Clearing the air about surgical smoke: An education program. *AORN Journal*, 103(3), 289–296. <https://doi.org/10.1016/j.aorn.2016.01.007>
11. Ostapovych, U., & Vortman, R. (2022). Implementing a surgical smoke evacuation policy and procedure: A quality improvement project. *AORN Journal*, 115(2), 139–146. <https://doi.org/10.1002/aorn.13603>