



Capstone Design Project Abstract

Project Title: Operating Room Smoke Evacuation Solutions

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The Operating Room Smoke Evacuation Solutions team, in collaboration with Owens & Minor, aims to build a compact, efficient smoke evacuation solution that effectively removes surgical smoke directly at the surgery incision site while maintaining sterility, usability, and regulatory compliance. Surgical smoke is produced when tissue is burned during surgeries from energy-based surgical instruments. This harmful product contains toxic chemicals, lung-damaging particles, blood, and potentially viable cells, viruses, and bacteria that are of significant concern. Healthcare workers and patients, particularly operating room surgeons, nurses, anesthesiologists, and surgical technologists, are susceptible to medical risks, including respiratory irritation, headaches, dizziness, and transmission of infectious diseases. Following the 2021 Association of periOperative Registered Nurses (AORN) updated guidelines on surgical smoke safety and the 20 U.S. states that have already enacted surgical smoke evacuation legislation, Georgia hospitals will likely soon be required to follow these legislative guidelines to protect their healthcare workers.

The proposed solution is a novel adhesive drape smoke evacuation device that consists of a capture device positioned close to the surgical site to remove the smoke at its source, connected to tubing, a polytetrafluoroethylene (PTFE) filter, and a vacuum pump. Additionally, the capture device is connected to a surgical drape with an adhesive mounting on the underside of the device. The adhesive drape smoke evacuation device is compact and unobtrusive, removing smoke effectively without compromising the sterility of the operating room. The device also maintains laminar airflow and positive pressure without disrupting surgical workflow or visibility. To enhance clinical adoption and strengthen surgeon buy-in, the team focused on quantifiable performance metrics to demonstrate measurable benefits. Together, these considerations ensure that the device is safe, compliant, and optimized for real-world use.