

1-2020

Device for the Capture and Extraction of Waste Anesthetic Gas

Jonathan Karp

Thomas Jefferson University, jonathan.karp@jefferson.edu

Cary Hess

Thomas Jefferson University, cary.hess@jefferson.edu

Delara Kiani

Thomas Jefferson University, delara.kiani@jefferson.edu

Corey Jameson

Thomas Jefferson University, corey.jameson@jefferson.edu

Robert S. Pugliese

Thomas Jefferson University, Robert.Pugliese@jefferson.edu

See next page for additional authors

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Recommended Citation

Karp, Jonathan; Hess, Cary; Kiani, Delara; Jameson, Corey; Pugliese, Robert S.; Mahla, Michael E.; Gravenstein, Dietrich; and Herman, Mary, "Device for the Capture and Extraction of Waste Anesthetic Gas" (2020). *Phase 1*. Paper 17.

https://jdc.jefferson.edu/si_des_2022_phase1/17

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Authors

Jonathan Karp, Cary Hess, Delara Kiani, Corey Jameson, Robert S. Pugliese, Michael E. Mahla, Dietrich Gravenstein, and Mary Herman

Jonathan Karp**
Cary Hess**
Delara Kiani**
Corey Jameson**
Robert Pugliese*
Michael Mahla*
Dietrich Gravenstein*
Mary Herman*

Device for the Capture and Extraction of Waste Anesthetic Gas

Background

Leaks occur often throughout the process of delivering inhaled anesthesia prior to and during surgery. Leaks typically occur around the patient's mouth, nose, and eyes. Potent inhaled anesthetics (PIAs) include halothane, sevoflurane, desflurane, and isoflurane. All PIAs, to one degree or another, pose hazards to human health. PIAs are associated with reproductive toxicity, spontaneous miscarriages in pregnant persons as well as an increased risk of congenital abnormalities in offspring. In other words, PIAs are thought to be both abortifacients as well as teratogens. PIAs are also associated with hepatotoxicity, neurotoxicity, cognitive impairment, as well as increased incidence of malignancy.

Methods

Preliminary interviews with stakeholders were conducted to assess the desirability, viability, and utility of a product to trap and remove waste anesthetic gas (WAG) from the perifacial region before it diffuses into the ambient air. We used wearable detector badges (similar to a dosimeter) from Assay Technology Inc. for qualitative measurements of WAG levels in several operating rooms. We used low-fidelity mockups for early prototyping, FDM and SLA 3D printing techniques, and urethane casts for high-fidelity working prototypes. We also performed real-time simulations using a visible aerosol agent in order to record and study the efficacy of our device.

Results

We found dramatically elevated levels of sevoflurane in the operating room, with our highest readings at ~10x NIOSH permissible exposure limits. With our visual simulation we saw a markedly reduced flow of WAG into the surrounding air.

Conclusions

Our device adequately addresses a significant and unaddressed issue in healthcare and shows viability from an economic standpoint as well. We are currently designing a study to further evaluate levels of WAG and exploring potential studies with live anesthetic agents.