

# Comment on “Intraoperative Electrosurgical Smoke During Outpatient Surgery: A Survey of Dermatologic Surgeon and Staff Preferences”

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To the Editor:

We read with great interest the recent *Cutis* article by Golda et al,<sup>1</sup> “Intraoperative Electrosurgical Smoke During Outpatient Surgery: A Survey of Dermatologic Surgeon and Staff Preferences.” We applaud the growing interest in the topic of dermatologist safety, as there are currently no established guidelines for precautions while performing surgical procedures. In 2018 we conducted a comprehensive review<sup>2</sup> to characterize the specific risks, hazard reduction strategies available, and current use of surgical smoke safety techniques during surgery among dermatologists, and ultimately recommend guidance based on the current available evidence. To conduct this review, we collected data from 45 manuscripts in the dermatology, surgery, infectious disease, obstetrics, and cancer biology literature. Herein, we summarize key findings.<sup>2</sup>

Dermatologic surgeons, residents, staff, and patients are exposed to many infectious, inhalational, chemical, and mutagenic hazards when performing procedures that liberate smoke and plume. These risks are commonplace; however, they are particularly notable during ablative laser and laser hair removal procedures, which produce a heavy plume (averaging >100,000 particles/cm<sup>3</sup>). Brief periods of heavy plume exposure also are commonplace during electrosurgery.

Infectious particles in surgical plume have been extensively studied, and viral transmission has been demonstrated in animal studies. Human papillomavirus transmission appears to be the most prevalent risk. Surgical smoke has been shown to cause acute and chronic inhalational injury in rat and sheep studies.<sup>3-6</sup>

Additionally, chemicals with carcinogenic potential are present in surgical smoke and have been described.<sup>7,8</sup> Chemicals in the greatest quantity include hydrocarbons, nitriles, fatty acids, and phenols. Although there have been no human studies on smoke carcinogenesis to date, surgical smoke has been shown to have carcinogenic properties in vitro.

Given these risks—both evidence based and theoretical—we believe that diligent hazard reduction strategies should be employed whenever possible. Surgical masks and high-efficiency particulate air respirators, such as N95 respirator masks, have been well studied and do provide smoke protection. High-efficiency particulate air masks can be worn when possible, especially during procedures that produce heavy plume, though surgical masks are capable of filtering most of the noxious chemicals in surgical smoke. It should be noted that proper fit with minimal air leak is the most important aspect of overall performance.

Smoke evacuators provide another level of protection. The physician should consider the evacuator’s filtration efficiency, capture velocity, and suction strength when evaluating overall performance. Furthermore, the smoke collection tip should be within 2 in of the surgical field to maximize efficacy. Maintenance for smoke evacuation systems should include regular (as defined by manufacturer instructions) flushing of the smoke evacuator lines.

Despite the risks of surgical smoke and the available options of minimizing these risks, the hazards of surgical smoke and the importance of protection are likely underemphasized. Many dermatologic surgeons do not use surgical masks or smoke evacuators in routine practice, according to several survey studies.<sup>9-11</sup>

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It is important for the dermatologic community to consider effective ways of spreading awareness. We propose that surgical smoke safety be taught early in residency training. Additionally, smoke safety can be implemented into certification examinations. Access to masks and smoke evacuation devices are an important part of dermatology training. Accreditation Council for Graduate Medical Education funds should be appropriated to provide for such resources.

Finally, and perhaps most importantly, continued awareness should be established in the dermatology community via standardized guidelines and periodic updates in the dermatology literature and lectures at local and national conferences. Not until these strategies are implemented will surgical smoke protection be viewed as a necessary and important component of routine practice when performing dermatologic surgical procedures.

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