SKIN

# RESEARCH LETTER

## Smoke Evacuation in Dermatology: A National Cross-Sectional Analysis Examining the Behaviors and Perceptions of Dermatologists and Dermatologic Surgeons

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## ABSTRACT

**Background:** Despite associated hazards of surgical smoke, there is limited data regarding smoke evacuation practices among dermatologists. Such information is especially relevant at this time as dermatologic procedures often involve exposure to aerosolized particles and known carcinogens.

**Objective:** To examine the barriers underlying historically low utilization of smoke protection among dermatologists

**Methods:** A survey was sent to dermatologists through the Association of Professors of Dermatology (APD) list-serv and a cross-sectional analysis of responses was performed.

**Results:** A total of 85 dermatologists responded. Twenty-four (28.2%) reported use of smoke evacuators during > 50% of dermatologic procedures. The odds of using smoke evacuation was 2.8 times higher in dermatologists with 10 or more years of experience (95% CI, 1.1-7.5; p=0.0358). The most commonly reported barriers to smoke evacuation were limited staffing (63.5%) and set-up time (61.2%). Sixty-seven (78.8%) respondents reported that a hands-free evacuator could potentially increase the use of smoke evacuation in their practices.

**Limitations**: Survey sent on academic listserv with relatively small sample size and limited generalizability.

**Conclusions:** Smoke evacuation remains low among dermatologists despite the risks. Identifying reasons for low utilization and receptiveness to potential solutions is necessary to improve safety practices relating to smoke evacuation.

## INTRODUCTION

Surgical smoke is an occupational hazard in surgical and cosmetic dermatology. One gram of tissue vaporized by carbon dioxide ($CO_2$) laser and one gram of electrocauterized tissue contain the mutagenic potential of six and three unfiltered cigarettes, respectively.[1] Additionally, there have been several studies proving transmissibility of human papillomavirus (HPV) in the smoke plume,[2,3] with several studies suggesting transmissibility of other viruses and bacteria.[3,4] Proper utilization of smoke protection is essential to mitigate the infectious, mutagenic, and direct physical hazards encountered over decades of practice. Our aim is to elucidate the causes

behind historically low utilization of protective devices and provide potential solutions.

## METHODS

A survey was sent to dermatologists through the Association of Professors of Dermatology (APD) list-serv and cross-sectional analysis of responses was performed.

## RESULTS

A total of 85 dermatologists responded. Table I dichotomizes “smoke evacuator use” as “infrequent use” (50% or less) versus “frequent use” (51% or more). The odds of using smoke evacuation was 2.8 times higher in dermatologists with 10 or more years of experience (95% CI, 1.1-7.5; p=0.0358). Of the dermatologists using smoke evacuation frequently, 18 (75.0%) performed more than 100 surgeries per year versus 6 (25.0%) who performed less (p=0.0573). Other variables such as gender, age, and practice setting did not significantly affect whether smoke evacuation was used frequently.

The most commonly reported responses as to why smoke evacuators are not used were limited staffing (63.5 %) and set-up time of evacuators (61.2%) (Table II). Regarding potential solutions to increase the use of smoke evacuators, the most common response at 78.8% was use of a hands-free surgical smoke evacuator followed by “education regarding risks associated with surgical smoke” at 70.6% (Table II).

## DISCUSSION

The results reflect those of previous publications showing low utilization of protective devices.[1] 71.8% reported “infrequent use” (50% or less) of surgical smoke evacuators. There appears to be more frequent utilization of smoke evacuation among dermatologists with more years of experience and those with higher case volumes and supporting staff.

This survey directly addresses barriers to smoke evacuator use by asking dermatologists, in their opinion, why smoke evacuation is not always used. The most common reported barrier was availability of supporting staff, followed by set-up required to use a smoke evacuator. Seventy-eight percent of dermatologists respond that the availability of a hands-free surgical smoke evacuator would facilitate the implementation of smoke evacuation in clinic. A potential solution to this issue is addressed in a recently published, hands-free setup for the smoke evacuator.[5] Furthermore, over half of respondents cite lack of education regarding associated hazards of surgical smoke as contributing to lack of protection, and 70.6% believe that further education regarding risks associated with surgical smoke would increase utilization of smoke evacuators.

## CONCLUSION

Surgical smoke produced during dermatologic procedures has been shown to contain multiple hazardous materials. Nevertheless, low compliance with smoke evacuators remains a prevalent issue. Identifying reasons for low compliance will aid in the development of solutions that will increase smoke evacuator use among

**Table I.** Characteristics of the study population

| Demographic characteristics | *Infrequent use of smoke evacuators (n= 61), No. (%) | **Frequent use of smoke evacuators (n=24), No. (%) | p-value |
|---|---|---|---|
| **Gender** | | | 0.832 |
| *Male* | 24 (40.0) | 9 (37.50) | |
| *Female* | 36 (60.0) | 15 (62.50) | |
| **Age, median (range)** | 38 (26-69) | 42 (29-67) | 0.433 |
| **Geography** | | | 0.0524 |
| *Midwest* | 25 (41.0) | 9 (37.5) | |
| *Northeast* | 12 (19.7) | 4 (16.7) | |
| *Southeast* | 17 (27.9) | 2 (8.3) | |
| *West* | 5 (8.2) | 7 (29.2) | |
| *Southwest* | 2 (3.3) | 2 (8.3) | |
| **Practice setting** | | | 0.735 |
| *Academic* | 54 (88.5) | 22 (91.7) | |
| *Private practice* | 5 (8.2) | 1 (4.2) | |
| *Multi-specialty* | 1 (1.6) | 0 (0) | |
| *Veterans Affairs hospital* | 1 (1.6) | 1 (4.2) | |
| **Experience: Number of years in dermatology practice** | | | |
| *More than 10 years* | 16 (26.2) | 12 (50.0) | 0.0358 |
| *Less than 10 years* | 45 (73.8) | 12 (50.0) | |
| **Caseload: Number of dermatologic surgeries per year** | | | |
| *More than 100 cases* | 32 (52.5) | 18 (75.0) | 0.0573 |
| *Less than 100 cases* | 29 (47.5) | 6 (25.0) | |
| **No. of staff available to assist during dermatologic procedures, median (range)** | 3.0 (0-30) | 3.0 (1-50) | 0.1 |
| **Prior training (dermatology residency and/or fellowship) included use of smoke evacuator** | | | |
| *Yes* | 17 (27.9) | 9 (37.5) | 0.386 |
| *No* | 44 (72.1) | 15 (62.5) | |

*"Infrequent use" of smoke evacuators is defined as "use of smoke evacuator during 50% or less of cases generating surgical smoke".
**"Frequent use" of smoke evacuators is defined as "use of smoke evacuator during more than 50% of cases generating surgical smoke".

**Table II.** Barriers to the use of smoke evacuation and proposed solutions

| Reason why smoke evacuation is not commonly used | No. of respondents (% total)* | Proposed solutions to facilitate smoke evacuator use | No. of respondents (% total)* |
|---|---|---|---|
| **Staffing (i.e. operating alone or requiring both assistant's hands)** | 54 (63.5) | Use of a hands-free surgical smoke evacuator | 67 (78.8) |
| **Set-up time of evacuators** | 52 (61.2) | Education regarding risks associated with surgical smoke | 60 (70.6) |
| **Cost associated with smoke evacuators** | 44 (51.8) | Increase N95 mask availability | 17 (20) |
| **Lack of training regarding** | 38 (44.7) | Other | 12 (14) |

| | |
|---|---|
| **surgical smoke and smoke evacuators** | |
| **Different form of smoke protection used (i.e. N95 mask)** | 5 (5.9) |
| **Other** | 9 (10.6) |

*Respondents were asked to select all choices that applied. Percentages will not add up to 100%.

dermatologists and mitigate associated risks of smoke exposure.

**IRB approval status:** Exempted from review by Indiana University Human Research Protection Program office

**Conflict of Interest Disclosures:** None

**Funding:** None

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