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Wildfire smoke knowledge gaps: A survey of pediatric pulmonary providers in Washington State

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1 INTRODUCTION

Evidence is accumulating linking wildfire smoke (WFS) exposure with multiple negative health consequences across the life course, including adverse respiratory, cardiovascular, and mental health effects.[1] Children are particularly susceptible, as WFS exposure can increase their risk of asthma exacerbation and frequency of upper respiratory and lower respiratory tract infections.[2] Early life may be a critical period of vulnerability to exposure, based on links between WFS exposure and increased respiratory emergency department visits which are stronger for younger compared to older children,[2] and increased risk of preterm birth and low birth weight.[3]

Drier and hotter conditions due to climate change have resulted in increased numbers and size of wildfires, increased human WFS exposure, and disproportionate impacts on socially disadvantaged communities.[4,5] People living outside the traditionally fire-prone Western United States (U.S.) are increasingly affected, as evidenced by both the recent record-setting Canadian wildfires impacting air quality across the Eastern and Midwest U.S., and the unprecedented wildfires that devastated Hawaiian communities on Maui.

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Ethics Statement: This study was reviewed by the University of Washington Human Subjects Division and was determined to be exempt.

Based on this increasing urgency, a 2021 American Thoracic Society workshop recognized the important role clinicians can play in communicating the risks and importance of preventing WFS exposure to patients and their families.[1] However, this topic is not commonly included in pediatric pulmonology training curricula and few continuing medical education (CME) efforts address this important health concern. We sought to evaluate the experience and confidence of pediatric pulmonary providers in discussing WFS health risks and prevention strategies in Washington State to understand knowledge gaps and inform strategies to close them.

2 MATERIALS AND METHODS

We identified all practicing pediatric pulmonology physicians and fellows in Washington State, which included members of four institutions and one fellowship program (N=37) located across the state. These individuals were sent e-mail invitations to participate and a link to the survey. On clicking the link, eligibility was verified, and eligible participants could then complete the survey via REDCap (Supporting material: Reference 1). Inclusion criteria included currently seeing children as a pediatric pulmonary physician or fellow in a clinical setting. The survey was available for completion between May 26 and July 17, 2023. This study was reviewed by the University of Washington Human Subjects Division and was determined to be exempt, and formal informed consent was not required.

Survey questions included demographic information (years of experience and region of medical school, residency, and fellowship training), prior formal WFS instruction, and clinical experience with children affected by WFS (Supporting information: E-Table 1). We also assessed participants' confidence related to specific WFS content areas. Finally, we asked for opinions on the importance of discussing WFS during clinical encounters. We used descriptive statistics to characterize demographics and response frequencies.

3 RESULTS

Seven fellows and 21 practicing pediatric pulmonologists responded to the survey (total n=28; response rate 76% of eligible individuals). Participants ranged from first-year fellows to pulmonologists with 15 or more years of experience (Table 1). Approximately half completed medical school in the Western U.S.; three-quarters completed residency and fellowship in the Western U.S.

The vast majority of participants had recent experience caring for children impacted by WFS (96%) and had counselled on how to protect against WFS (93%, Figure 1). However, few had formal WSF instruction (32%). None reported having received WFS-related instruction in medical school, and few recalled receiving it during pediatrics residency (11%), pediatric pulmonary fellowship (14%), or as a practicing physician (21%).

Most participants indicated confidence in understanding the clinical impact of WFS on children (82%) and identifying those at higher risk of negative WFS impact (71%). Confidence was much lower in understanding how the Air Quality Index (AQI) is determined (32%) and its limitations (25%), or knowing where to look for reliable guidance to manage WFS exposure (25%). In addition, few participants felt comfortable counseling

on how to protect from WFS (36%), an interesting contrast to 93% of participants who indicated that they counsel on this topic. Almost all participants considered communicating about WFS to be important to both themselves (89%) and the children and families they care for (96%), and 89% reported believing that pediatric pulmonologists have a responsibility to discuss WFS during clinical encounters.

4 DISCUSSION

Our results illustrate that more than 90% of pediatric pulmonologists and fellows in Washington State encounter children affected by WFS and believe that addressing WFS during clinical encounters is important. However, their knowledge and confidence in this topic—particularly regarding exposure reduction counseling, accessing reliable guidelines, and using the AQI—are inadequate. These results mirror those found by a survey of Canadian healthcare providers performed in 2021,[6] and indicate insufficient exposure to these topics at all levels of training. These findings are surprising given that Washington is among the states most affected by WFS and most participants were trained or are training in Western states. As this was a single-state study, a national assessment is needed to verify results and further assess needs in a broader sample.

Current guidance that pulmonologists can share with their patients and families for protection from WFS are readily available through a variety of sources, including general information from the U.S. Centers for Disease Control and Prevention, U.S. Environmental Protection Agency, and American Thoracic Society, and pediatric-specific guidance and printable fact sheets from the Pediatric Environmental Health Specialty Units and the American Academy of Pediatrics (see Supporting information: References 2–7). Recommendations include checking the current and forecasted Air Quality Index (AQI), and changing behavior when air quality is poor based on the AQI and/or visible smoke or odor. Behavior changes include avoiding or reducing intensity of outdoor activity, closing windows and doors to reduce infiltration of smoke, reducing other sources of indoor pollution (such as cigarette smoke or wood-burning stoves), running HEPA air cleaners and/or central HVAC systems with appropriate filters, wearing properly fitting N95 masks (for children ages 7 and up; see Supporting information: Reference 7), creating a “clean room” in the home, and evacuation when indoor air quality is unsafe. Parents of children with respiratory disease should also ensure their child takes their prescribed medications and has an up-to-date respiratory management plan.

The Air Quality Index (AQI) is a measure based on several air pollutants including particulate matter (PM2.5) and ozone (both found in high concentration in WFS), which is intended to communicate health risks of current air quality and guide individual and public health action. The index includes six color-coded levels of air quality ranging from “Good” to “Hazardous,” with each level corresponding to recommended actions for sensitive individuals (including those with chronic respiratory disease) and everyone else. Guidance on interpretation and use of the AQI, as well as current and forecast values, can be found at www.airnow.gov. Slavik et al offer several strategies for educating families about using the AQI and other methods to reduce WFS exposure for children (see Supporting information: Reference 8).

For pediatric pulmonologists to effectively help children with respiratory disease avoid the negative impacts of WFS, we must become familiar with this guidance and learn how to effectively communicate it to patients and their families. Future efforts should address how to best incorporate WFS topics into pediatric training and CME curricula. One good example is the U.S. Environmental Protection Agency online CME course “Wildfire Smoke and Your Patients’ Health”, which is designed for diverse types of health professionals including nurses, physicians, and asthma educators (Supporting information, Reference 9). However, this resource is not tailored for use in a pediatric population. Pediatric health care providers including pulmonary specialists should be involved in the development of additional targeted materials in order to enhance integration and reach. Additional potential didactic strategies include grand-rounds presentations from climate advocates and WFS research experts, interactive lectures, educational videos, case studies, and, perhaps most importantly, board exam questions focusing on WFS. Of note, the American Board of Pediatrics content specifications for the Pediatric Pulmonology certifying exam already include the subdomains “smoke and thermal inhalation injury” and “air pollution and irritants” (Supporting information, Reference 10), but our study provides evidence that this has not been sufficient to motivate inclusion of WFS topics in fellowship or robust CME curricula. In addition, our results indicate that specific content areas such as how to use the AQI, strategies for WFS exposure reduction, and identification of resources are greatly needed.

5 CONCLUSION

Wildfire smoke exposure is a rapidly emerging public health issue, and the burden of the health impact of WFS is only expected to worsen. There is urgent need for a nationwide assessment of the educational needs of pediatric pulmonologists on this issue, as well as swift action to address knowledge gaps. If given the tools to do so, pediatric pulmonologists are uniquely poised to offer high quality, actionable advice on ways to mitigate the risk for their patients.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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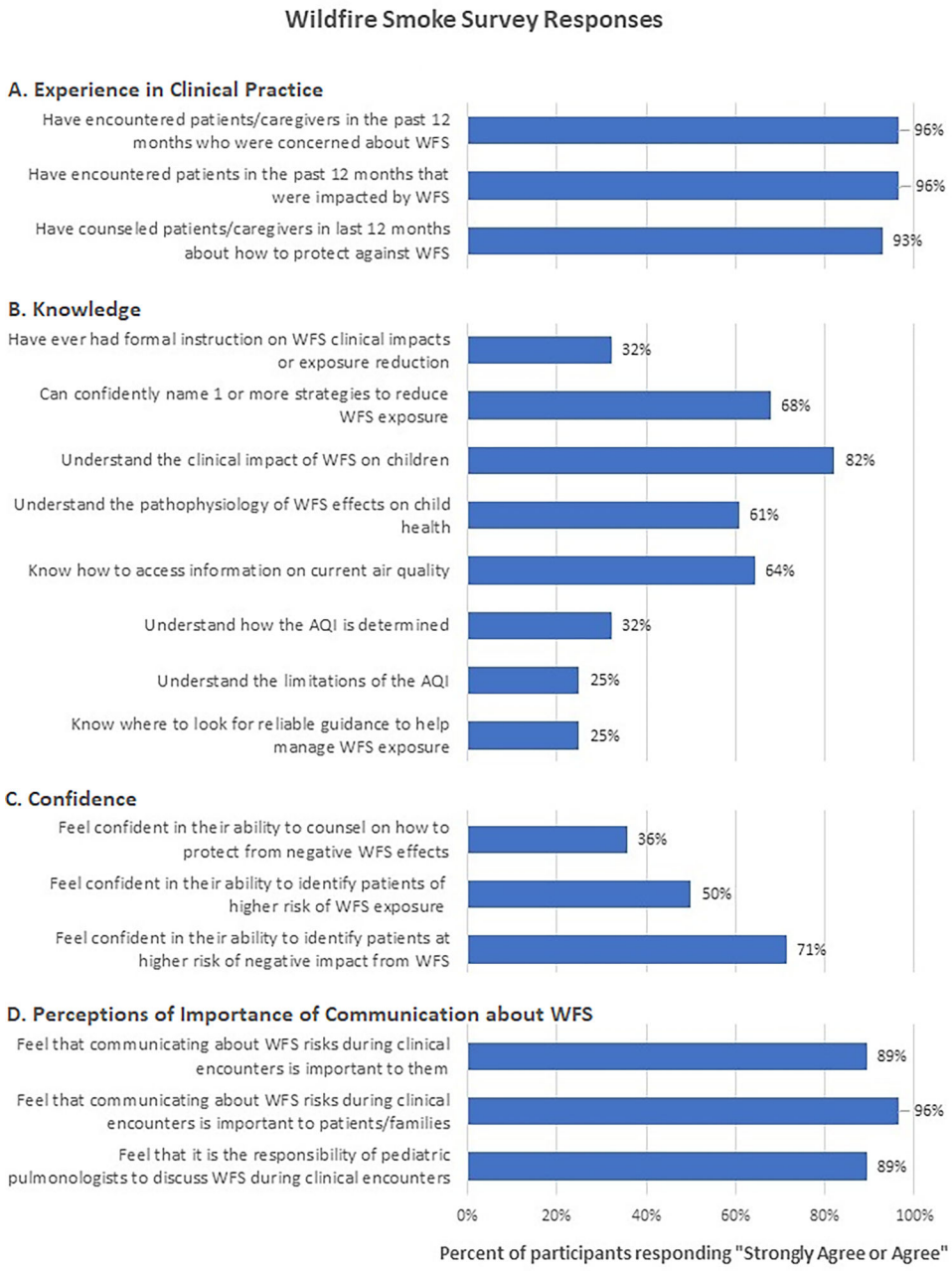

Figure 1.

Percentage of respondents answering “Strongly agree” or “Agree” to individual survey items. AQI, Air Quality Index; WFS, wildfire smoke.

Table 1:

Demographics of respondents

Characteristic	n (%), total n=28
Length of experience	
Current fellow	7 (25%)
Practicing pediatric pulmonologist (0 to <5 years)	7 (25%)
Practicing pediatric pulmonologist (5 to <10 years)	4 (14%)
Practicing pediatric pulmonologist (10 to <15 years)	2 (7%)
Practicing pediatric pulmonologist (15 or more years)	8 (29%)
Completed medical school in a Western state *	15 (54%)
Completed residency in a Western state	21 (75%)
Completed (or are completing) fellowship in a Western state	23 (82%)

* Western states = AK, CA, CO, ID, MT, NV, OR, UT, WA, WY