Across the United States, increased air pollution corresponded to increased queries for itch. The SVI for the term *itch* was correlated with concentration of atmospheric $PM_{2.5}$ ($R^2 = 0.30$; $P < .001$) (Fig 1), whereas the control SVI for the term *acne* was not ($R^2 = 0.016$; $P = .394$) (Fig 1). After adjustment for temperature, seasonality, and population density factors, itch SVI and $PM_{2.5}$ concentration still demonstrated a strong correlation ($\beta = 2.07$, $P = .016$, $R^2 = 0.6494$). Carbon dioxide emission levels were used as a negative control to demonstrate specificity between $PM_{2.5}$ and itch; no significant association between carbon dioxide levels and SVIs for any search terms was found.

Our results demonstrate that increasing levels of fine particulate matter air pollution are associated with higher search interest in itch, highlighting the potential role of environmental modulation in these conditions. In contrast, $PM_{2.5}$ air pollution did not show a similar correlation with search interest in acne. These findings may be explained by pollutant-induced sensitization and activation of cutaneous sensory nerves mediated by neurotrophin release from epidermal keratinocytes.[4] In addition, exposure to particulate matter was shown in an in vitro study of human epidermal keratinocytes to cause increased release of proinflammatory cytokines, which play a central role in itch transmission.[1] Lastly, itch was shown to result from ligand-mediated activation of the aryl hydrocarbon receptor pathway by particulate matter in an animal model of atopic dermatitis.[5] Future work in epidemiologic and clinical research can help further confirm the association between particulate matter air pollution and increased itch that was demonstrated in this study.

Katherine A. Whang, BS,[a] Amy H. Huang, MPH,[a,b] Lloyd S. Miller, MD, PhD,[a] Sewon Kang, MD,[a] and Shawn G. Kwatra, MD[a,b]

Department of Dermatology, Johns Hopkins University School of Medicine,[a] and Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland[b]

Ms Whang and Ms Huang are cofirst authors.

Funding sources: None.

Disclosure: Dr Kwatra is an advisory board member for Menlo and Trevi Therapeutics. Ms Whang, Ms Huang, Dr Miller, and Dr Kang have no conflicts of interest to disclose.

Reprints not available from the authors.

Correspondence to: Shawn G. Kwatra, MD, Cancer Research Building II, Johns Hopkins University School of Medicine, Suite 206, 1550 Orleans St, Baltimore, MD 21231

E-mail: skwatra1@jhmi.edu

REFERENCES

1. Mancebo SE, Wang SQ. Recognizing the impact of ambient air pollution on skin health. *J Eur Acad Dermatol Venereol*. 2015;29(12):2326-2332.
2. Grandhi R, He A, Semenov YR, Kwatra SG. Seasonal variation of itch: a study using real-time data from 2004 to 2016. *J Am Acad Dermatol*. 2017;76(3):563-564.
3. Nuti SV, Wayda B, Ranasinghe I, et al. The use of Google Trends in health care research: a systematic review. *PLoS One*. 2014;9(10):e109583.
4. Ständer S, Schneider SW, Weishaupt C, Luger TA, Misery L. Putative neuronal mechanisms of sensitive skin. *Exp Dermatol*. 2009;18(5):417-423.
5. Hidaka T, Ogawa E, Kobayashi EH, et al. The aryl hydrocarbon receptor AhR links atopic dermatitis and air pollution via induction of the neurotrophic factor artemin. *Nat Immunol*. 2017;18(1):64-73.

https://doi.org/10.1016/j.jaad.2019.04.069

Timing of mucocutaneous symptoms and medication discontinuation in patients with Stevens-Johnson syndrome and toxic epidermal necrolysis in the United States

To the Editor: Stevens-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) are severe mucocutaneous reactions commonly triggered by medications. Although small single-institution studies have demonstrated improved outcomes with shorter time to admission and earlier discontinuation of the causative drug, the precise timing of initiation and discontinuation of suspected medications has not been evaluated in a large cohort.[1,2] We conducted a retrospective cohort study using a multi-institutional cohort of patients from the United States in whom SJS/TEN had been diagnosed, as previously described.[3] The causative drug was determined by expert clinical judgment at the time of dermatology consultation. Available criteria from the algorithm of drug causality for epidermal necrolysis were used to exclude cases with unlikely or doubtful causality on the basis of "delay from initial drug component intake to onset of reaction" and "drug present in the body on index day" (n = 50).[4] Descriptive statistics were used to evaluate timing between medication initiation, symptom onset, and medication discontinuation. Univariate logistic regression was used to identify factors associated with discontinuation of the medication at the time of symptom onset and to examine the relationship between drug discontinuation and mortality, adjusted for age and sex.

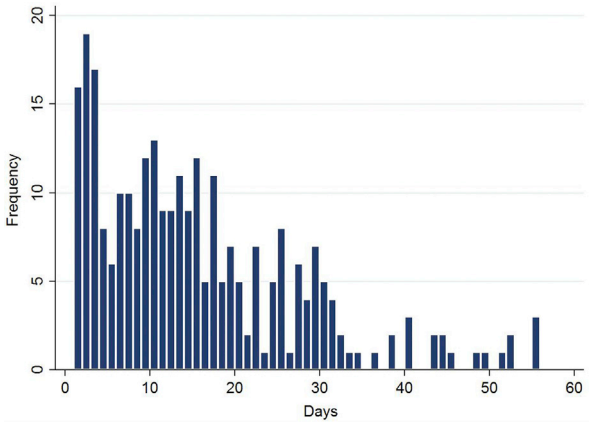

Fig 1. Days from start of the suspected culprit medication to onset of mucocutaneous symptoms.

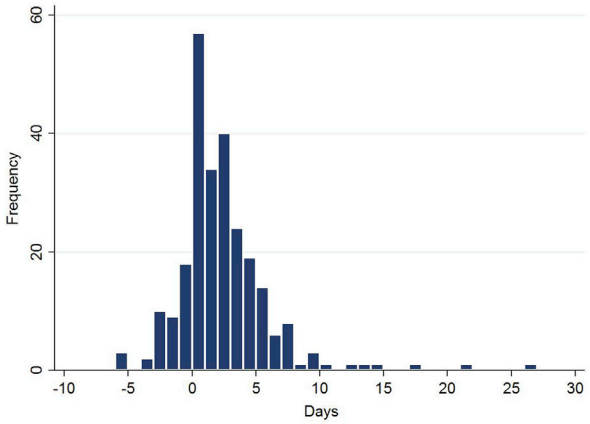

Fig 2. Days from onset of mucocutaneous symptoms to discontinuation of the suspected culprit medication.

Of the 255 patients, 51.8% were female, with a mean age of 49.3 years (standard deviation, 19.6). The median body surface area of involvement at admission was 15% (interquartile range [IQR], 5%-30%), and the in-hospital mortality rate was 12.6%. The median duration between medication initiation and symptom onset was 12 days (IQR, 5−21 days) (Fig 1). There was a median of 1 day (IQR, 0-3 days) between symptom onset and medication discontinuation; however, 156 individuals (61.2%) continued the suspected culprit medication after the initial day of symptoms (day 0). In 56 people (22.0%), the medication was continued for more than 3 days after onset of symptoms (Fig 2). Overall, 42 individuals (16.5%) discontinued the suspected medication before symptom onset. Discontinuation of the medication at the time of or before symptom onset was not associated with decreased mortality (odds ratio [OR], 0.98; 95% confidence interval [CI], 0.88-1.10). Similarly, there was no association when adjusting for medication class, medication half-life, or year of hospitalization. Female sex was the only factor associated with prompt medication discontinuation (OR. 1.92; 95% CI, 1.15−3.21).

In conclusion, we did not find an association between medication discontinuation and survival, contradicting previous research identifying an increased likelihood of survival (OR, 0.69 for each day; 95% CI, 0.53-0.89) with earlier discontinuation.[1] This difference may be due to an increased awareness of the importance of discontinuation by providers, causing the study to be underpowered to detect small differences. Our results show that most causative drugs were started within 2 weeks of symptom onset and some were discontinued before symptom onset, which is information that may help providers take a focused drug history in patients presenting with SJS/TEN. Limitations of this study include its retrospective design and lack of a systematic method for determining the causative drug, leading to possible misclassification bias. Replication in a prospective multicenter trial is necessary to confirm these findings.

We would like to thank our collaborators in the Society of Dermatology Hospitalists SJS/TEN Study Group: Adela Rambi G. Cardones, MD, Jennifer K. Chen, MD, Johnathan Cotliar, MD, Mark Denis P. Davis, MD, Arturo Dominguez, MD, Lindy P. Fox, MD, Lauren C. Hughey, MD, Benjamin H. Kaffenberger, MD, Daniela Kroshinsky, MD, MPH, Bernice Y. Kwong, MD, Daniel D. Miller, MD, Alex G. Ortega Loayza, MD, Misha Rosenbach, MD Victoria R. Sharon, MD, Kanade Shinkai, MD, PhD, Erika M. Summers, MD, Karolyn A. Wanat, MD, David A. Wetter, MD, and Scott Worswick, MD.

Megan H. Noe, MD, MPH, MSCE,[a] Robert G. Micheletti, MD,[a,b] Arash Mostaghimi, MD, MPA, MPH,[c] and the Society of Dermatology Hospitalists SJS/TEN Study Group

Department of Dermatology[a] and Department of Medicine, University of Pennsylvania Perelman School of Medicine, Philadelphia, Pennsylvania,[b] and Department of Dermatology, Brigham and Women's Hospital, Boston, Massachusetts[c]

Funding sources: Dr Noe receives research funding from the National Institute of Arthritis and Musculoskeletal and Skin Diseases (K23-AR073932).

Conflicts of interest: None disclosed.

Reprints not available from the authors.

Correspondence to: Megan H. Noe, MD, MPH, MSCE, University of Pennsylvania, Department of Dermatology, 3400 Civic Center Blvd, Philadelphia, PA 19104

E-mail: megan.noe@uphs.upenn.edu

REFERENCES

1. Garcia-Doval I, LeCleach L, Bocquet H, Otero XL, Roujeau JC. Toxic epidermal necrolysis and Stevens-Johnson syndrome: does early withdrawal of causative drugs decrease the risk of death? *Arch Dermatol*. 2000;136(3):323-327.
2. Schulz JT, Sheridan RL, Ryan CM, MacKool B, Tompkins RG. A 10-year experience with toxic epidermal necrolysis. *J Burn Care Rehabil*. 2000;21(3):199-204.
3. Micheletti RG, Chiesa-Fuxench Z, Noe MH, et al. Stevens-Johnson syndrome/toxic epidermal necrolysis: a multicenter retrospective study of 377 adult patients from the United States. *J Invest Dermatol*. 2018;138(11):2315-2321.
4. Sassolas B, Haddad C, Mockenhaupt M, et al. ALDEN, an algorithm for assessment of drug causality in Stevens-Johnson Syndrome and toxic epidermal necrolysis: comparison with case-control analysis. *Clin Pharmacol Ther*. 2010;88(1):60-68.

https://doi.org/10.1016/j.jaad.2019.05.020

Identifying a patient cohort responsible for a disproportionate number of lost opportunities for dermatologic care at a Veterans Affairs Medical Center

To the Editor: No-shows for dermatology appointments, reportedly as high as 17% to 31% in urban academic practices,[1] create lost opportunities for care, exacerbate the scarcity of dermatology access, and increase health care spending.[2] We hypothesized that lost opportunities may not be equally distributed among an entire patient population and thus sought to identify the cohort of patients that accounts for a disproportionate number of lost opportunities for dermatologic care. Identifying characteristics of the patients at highest risk of creating lost opportunities can reveal potential pathways amenable to intervention.

In this cross-sectional observational study of missed appointments for in-person, outpatient dermatology clinics at the main hospital of the Providence Veterans Affairs Medical Center (VAMC) between fiscal years 2015 and 2016, we defined a lost opportunity as a no-show (appointment neither completed nor cancelled by the patient or the clinic) or last-minute cancellation (within 24 hours of the appointment date). Our primary outcome was "multiple lost opportunities," defined as 2 or more no-shows or last-minute cancellations in the study period. Using Stata 14.1 software (StataCorp LLC, College Station, TX), we evaluated the associations between multiple lost opportunities and patient characteristics such as patient age, sex, race/ethnicity, marital status, urban residence, distance to the nearest VAMC, secondary insurance status, and previous number of missed appointments. We extracted data from the VHA Corporate Data Warehouse (CDW).[3]

In fiscal years 2015 and 2016, 5598 patients had 24,938 appointments for dermatologic care at the Providence VAMC. Of these, 16,668 appointments (66.8%) were fulfilled, 1852 (7.4%) were last-minute cancelled by the patient, and 1709 (6.9%) were no-shows. There were 628 patients (10.6%) who had multiple lost opportunities and accounted for 8676 appointments (34.8%), 1217 (65.8%) of all last-minute cancellations by the patient, and 1062 (62.1%) of all no-shows (Table I). A disproportionate number of dermatology appointments—particularly no-shows and last-minute cancellations—appear to be concentrated within a small cohort of patients. This pattern continues as the number of lost opportunities increases beyond 2.

Patients with multiple lost opportunities were more likely to be 21 to 40 years old, black, or nonmarried (Table II). This pattern is robust to thresholds of 3 and 4 lost opportunities; 6 lost opportunities was too small for significant associations to be determined (further data provided upon request). As in other studies, younger, unmarried, and historically underserved patients were more likely to have multiple lost opportunities,[4,5] which may be explained by the presence of complex social situations and cultural barriers to accessing care. Surprisingly, distance from the VAMC was not associated with multiple lost opportunities; this may be due to the relatively small geographic area served by the Providence VAMC as well as the availability of transport services to many veterans.

Although our study is limited by our single-site sample of a veteran population in a Northeastern region, the finding that there are small cohorts of patients responsible for a large proportion of lost opportunities may be generalizable to other practice settings. Practices interested in no-show behavior may consider identifying patients who have missed more than 1 appointment and eliciting barriers to appointment fulfillment.

Joy Zhou, MHS,[a] Martin A. Weinstock, MD, PhD,[a,b] Nicolae Done, PhD,[c] and Shoshana M. Landow, MD, MPH[a,b]

From the Department of Dermatology, The Warren Alpert Medical School of Brown University,[a] and Center for Dermatoepidemiology, Veterans Affairs Medical Center, Providence, Rhode Island[b]; and Center for Access Policy, Evaluation, and Research, Veterans Affairs Medical Center, Boston, Massachusetts[c]