

Evaluation of Public Interest in Mohs Surgery and Other Elective Surgical Procedures During the COVID-19 Pandemic

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BACKGROUND The reallocation of health care resources to focus on the acute care needs of COVID-19 patients leads to a delay and deferral of outpatient surgical procedures such as Mohs surgery.

OBJECTIVE Planning for the resumption of regular outpatient surgical care and preparing for future surges in COVID-19 cases requires identifying surrogate markers of health care demand.

MATERIALS AND METHODS United States national and state-based Google search data for “Mohs surgery” and other common elective surgical and cosmetic procedures were evaluated. These were compared with national and state-wide COVID-19 case number and death data from the Johns Hopkins University. Pearson correlation coefficients were generated to assess the association between COVID-19 cases and deaths with Google search trends.

RESULTS Search volume for “Mohs surgery” and other elective surgical and cosmetic procedures significantly decreased as the number of new deaths from COVID-19 increased. Statistically significant inverse correlation was noted between “Mohs surgery” search volume and new COVID-19 deaths on a national and state-based level.

CONCLUSION Search metric analysis may be used as part of a big data model to help predict health care demand during the reopening phase of the COVID-19 pandemic.

As the number of COVID-19 cases and deaths increased in the United States during March 2020, the US health care system reallocated resources to meet the acute care needs of COVID-19 patients by delaying dermatologic surgery and other elective medical procedures. Knowing when to reopen and preparing for a potential “second surge” in cases requires rapidly gauging public interest in elective procedures in an evolving pandemic. Search engine metrics have been shown to predict disease outbreaks, such as severe acute respiratory syndrome, 2 months before publication by the World Health Organization.¹ We previously used Google Trends (GT) to correlate the temporal and geographic incidence of tick-borne infectious diseases with search metric data.² Google Trends has also been used to evaluate the US population interest in skin cancer and association with melanoma outcomes.³ Additionally, GT searches for the term “Mohs surgery” have previously been used to gauge the growing public interest in Mohs micrographic surgery.⁴ Herein, an

inverse correlation between the number of COVID-19 deaths in the United States and GT searches for the term Mohs surgery and other common elective surgical procedures was observed.

Methods

Using GT, weekly US Google search data were evaluated for common surgical and cosmetic procedures (“Mohs surgery,” “cataract surgery,” “knee replacement,” “hip replacement,” “cesarean section,” “face lift,” “filler,” “Botox,” “liposuction”) between January 26, 2020, and November 29, 2020, divided into 2 phases, which corresponded with the initial pandemic and the more recent second surge in COVID-19 case numbers. These were compared with data compiled by the Johns Hopkins University of the total number of US COVID-19 cases, deaths, and the new numbers of COVID-19 cases and deaths in weekly intervals. Pearson correlation coefficients were generated to assess the association between COVID-19 cases and deaths with Google search trends. State-specific analysis was conducted by comparing state-based GT search data for “Mohs surgery” and weekly state-specific COVID-19 new deaths calculated using CDC COVID Data Tracker. Phase 1 indicates cases and deaths from the initial first surge of the pandemic from January 26, 2020, to July 5, 2020; Phase 2 indicates cases and deaths from July 6, 2020, to November 29, 2020, during the second surge of cases.

Results

Search volume for “Mohs surgery” significantly decreased as the number of new deaths from COVID-19 increased (Figure 1). Search volume for other common elective

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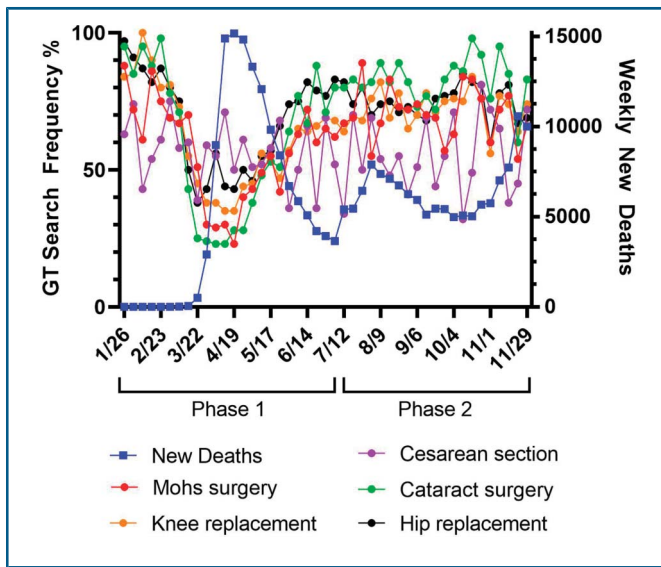


Figure 1. Inverse correlation between weekly US COVID-19 deaths and Google Trends (GT) search frequency for elective surgeries. Google trends search frequency % denotes the format of GT data, which normalizes search frequency for each search term from 0% to 100%.

surgeries, but not for emergent procedures such as a cesarean section, inversely correlated with new COVID-19 deaths in the United States during Phase 1 (January 26, 2020–July 5, 2020) but not during Phase 2 (July 6, 2020–November 29, 2020) of the COVID-19 pandemic. The nadir in search volume occurred during the week of 19th April, during which time the peak of new COVID-19 deaths reached a weekly high of 15,157. In fact, “Mohs surgery” search volume was lower in April 2020 than it has been in 11 years prior across the United States. The states with the most COVID-19 cases and deaths during the initial part of the pandemic (Massachusetts, New York, California, Pennsylvania; “early states”) displayed an earlier and greater decrease in search volume for “Mohs surgery” compared with states that were affected later in the pandemic (Texas, Florida, Arizona; “late states”) (Figure 2). Search volume for common cosmetic procedures decreased as the number of new deaths from COVID-19 increased (Figure 3). Google trends search volume returned to baseline, and even surpassed baseline for “fillers,” during the latter part of the pandemic.

As the number of weekly deaths decreased after April 19th to July 5th (Phase 1), searches for “Mohs surgery” and other elective and cosmetic surgical procedures increased, matching prepandemic levels. Statistically significant inverse correlations between search volume and new COVID-19 deaths and cases were noted for “Mohs surgery” and other elective procedures (See **Supplemental Digital Content 1**, Table S1, <http://links.lww.com/DSS/A775>) but not for emergent procedures such as a cesarean section. The weekly new cases of COVID-19 had a much weaker inverse correlation. The recent rise in new cases and deaths from July 6th to November 29th (Phase 2) did not result in a drop in GT search volume.

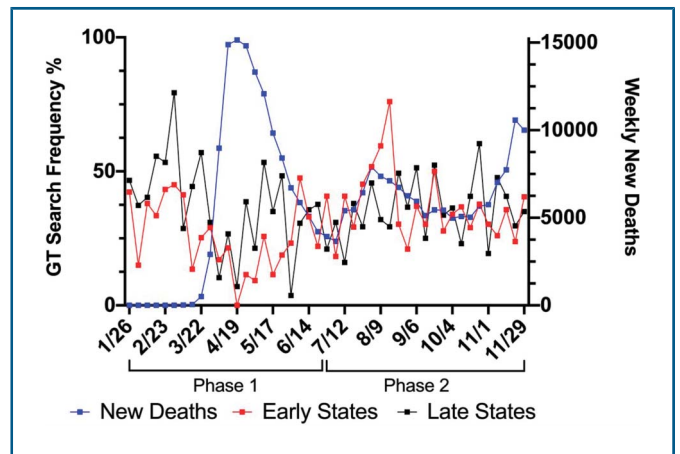


Figure 2. Inverse between weekly US COVID-19 deaths and Google Trends (GT) search frequency for “Mohs surgery” by early and late state averages. States were divided into early (New York, Massachusetts, Pennsylvania, California) and late (Arizona, Texas, and Florida) states, and Google trend search frequency was averaged for each group of states.

A focused analysis of state-specific COVID-19 death counts and state-specific Google searches for “Mohs surgery” was conducted (See **Supplemental Digital Content 2**, Table S2, <http://links.lww.com/DSS/A776>). Statistically significant inverse correlation was noted for New York, Pennsylvania, Massachusetts, and Florida in the initial pandemic (Phase 1) but not during the second surge of cases (Phase 2).

Discussion

As dermatologic surgeons and other surgical specialists prepare for a winter surge, it is important to gauge public interest in pursuing surgical care to prudently allocate health care resources. The search metric analysis suggests that the general public has regained interest in researching Mohs surgery and other elective surgical procedures after the peak of the COVID-19 pandemic has passed, with search volume returning to prepandemic levels. In contrast, search interest in emergent procedures such as a cesarean section was not affected by new COVID-19 deaths. Interestingly, new COVID-19–related deaths had a stronger influence than overall COVID-19 case numbers on search interest, suggesting that either news coverage or public perception of COVID-19 deaths served as a greater deterrent to resume regular medical care than information on total or new COVID-19 infected cases. This inverse relationship is strikingly notable across multiple elective surgical procedures (See **Supplemental Digital Content 3**, Table S1, <http://links.lww.com/DSS/A775>). The resurgence of public interest in cosmetic procedures (Figure 3) during the latter part of the pandemic is likely multifactorial. Possible explanations include the effects of an enhanced focus on personal facial features from viewing oneself on a regular basis during teleconferencing as the workforce shifted to remote work, more downtime available for

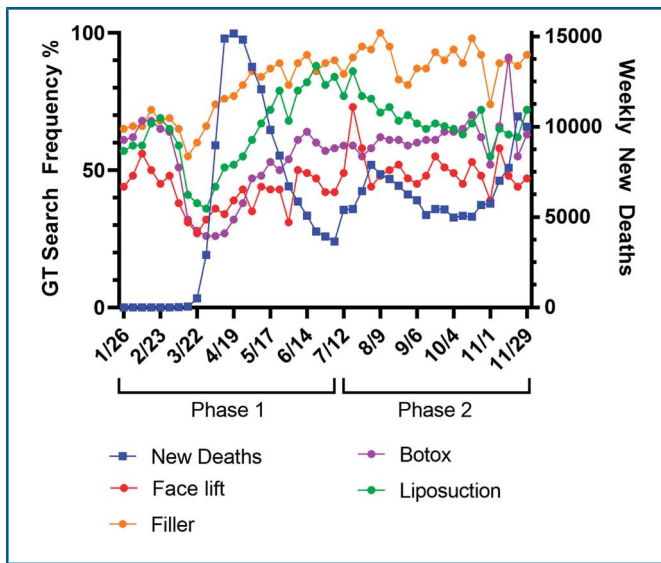


Figure 3. Inverse correlation between weekly US COVID-19 deaths and Google Trends (GT) search frequency for cosmetic procedures. GT search frequency % denotes the format of GT data, which normalizes search frequency for each search term from 0% to 100%.

recovery from larger cosmetic procedures, and the public’s regained comfort in reengaging the health care system.

State-based analysis showed that states that suffered the most COVID-19 cases and deaths during the start of the pandemic (Phase 1) had a greater decrease in search volume for “Mohs surgery” and statistically significant inverse correlation with COVID-19 deaths than states that were affected during the second surge (Phase 2) of the pandemic (Figure 2 and See Supplemental Digital Content 4, Table S2,

<http://links.lww.com/DSS/A776>). Nonetheless, the lowest search volume for “Mohs surgery” in all the examined US states was during April 2020. This trend suggests that the decrease in search interest is not due solely to the closure of medical facilities, which varied among different states in the United States. Rather, it is likely that the shifting focus on the global pandemic and initial fear of in-person medical care that resulted in the delay and deferral of dermatologic surgery, even if dermatologic offices were open in some states to provide it.

A confounding factor may be that fewer diagnostic tests were performed due to shutdown of preventative medical care, thereby leading to fewer test results necessitating elective procedures. The initiation of masking policies and other safety protocols in dermatology and Mohs surgery practices may have an effect of fostering patient comfort in reengaging the health care system after the initial surge of the pandemic passed. It is proposed that search metric analysis can be one part of a big data model that can be used to predict health care demand during the evolving COVID-19 pandemic.

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