

# Using Google to Trend Patient Interest in Botulinum Toxin and Hyaluronic Acid Fillers

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## ABSTRACT

**Introduction:** Google Search is an important tool for patients researching skin care treatments and finding dermatologists. Data from individual patient's searches are aggregated by Google and yield powerful data sets that can be used to trend population behaviors. This study investigates the correlations between the volume of Google searches and the number of procedures performed annually for both botulinum toxin type A and hyaluronic acid tissue fillers.

**Methods:** The volume of queries performed between 2005–2016 including [botox] or [hyaluronic acid + Juvederm + Perlane + Restylane + Prevelle] were analyzed in relation to the annual number of procedures using botulinum toxin type A and hyaluronic acid based soft tissue fillers, respectively.

**Results:** The number of procedures performed using botulinum toxin and hyaluronic acid correlated significantly with the relative search volume for related search terms in both the same year ( $P < .001$ ) and year prior ( $P < .001$ ).

**Conclusions:** Our findings highlight the importance of Google search data as a resource for understanding patient motivations and behavior. Dermatologists may use this resource as a tool to better address patient concerns and forecast local demand for specific procedures.

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DRUGS • DEVICES • METHODS

## INTRODUCTION

Google Search is an important tool for patients researching skin care treatments and finding dermatologists. Data from the 3 billion daily Google searches<sup>1</sup> can be used to trend epidemiological patterns within populations using Google Trends (<https://trends.google.com/trends>; Alphabet Inc.), which reports search volume as relative to the total number of queries performed within a specific period or region. This tool has already been mobilized in dermatology to understand patterns in tanning,<sup>2</sup> melanoma outcomes,<sup>3</sup> and interest in Mohs surgery.<sup>4</sup> In other industries, such as the automotive, real estate, retail, and travel industries, Google Trends is used regularly to forecast consumer demand.<sup>4</sup> In this study, we apply Google Trends to correlate relative search volume with patient demand for botulinum toxin and hyaluronic acid fillers.

## METHODS

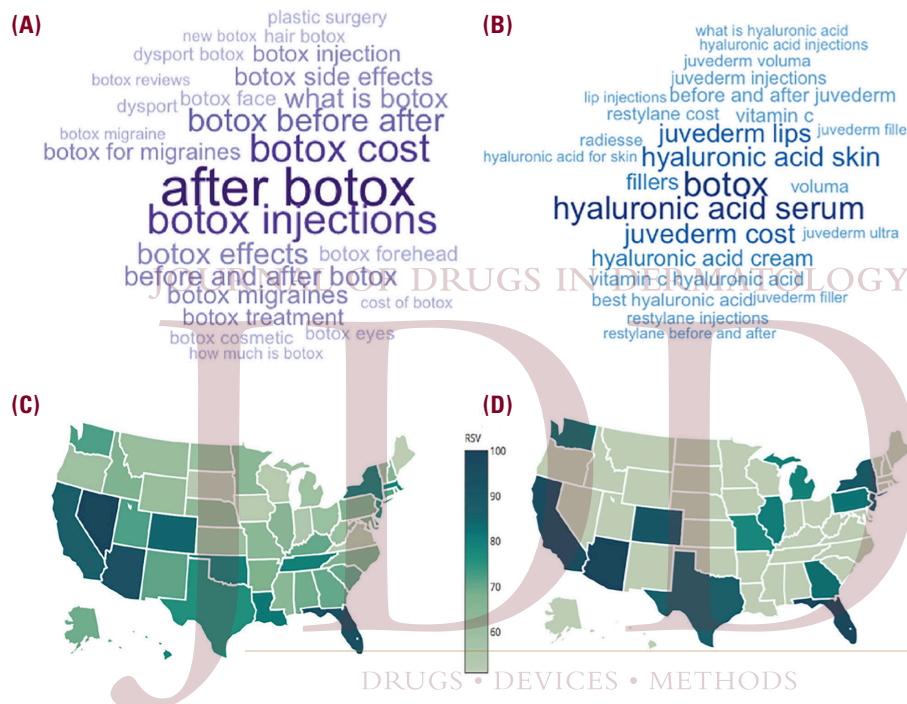
On October 15, 2017, the keyword botox was used to quantify searches for botulinum toxin type a; [Hyaluronic acid + Juvederm + Perlane + Restylane + Prevelle] was used for hyaluronic acid soft tissue fillers. Queries were limited to those performed within the United States from January 1, 2005 through December 31, 2016; all query categories were used. The following data was obtained: relative search volume (RSV) over time, RSV among states, and related queries searched for with the above terms.

The annual number of procedures performed using hyaluronic acid based soft tissue fillers and botulinum toxin type A were obtained for the years 2005 through 2016.<sup>5</sup> Annual RSVs were calculated by averaging all monthly RSVs in a given year. The Spearman's rank correlation coefficient ( $\rho$ ) was used to evaluate the association between the annual number of procedures and the annual RSV for the same year and the year prior with use of SPSS (version 23, IBM Inc, Armonk, NY).

## RESULTS

The number of procedures performed using botulinum toxin and hyaluronic acid soft tissue fillers correlated significantly with RSV in both the same year ( $\rho = 0.959$ ;  $P < .001$  for botulinum toxin;  $\rho = 0.867$ ;  $P < .001$  for hyaluronic acid soft tissue fillers) and year prior ( $\rho = 0.92$ ;  $P < .001$  for botulinum toxin;  $\rho = 0.827$ ;  $P < .001$  for hyaluronic acid soft tissue fillers). The most frequently searched related queries and the regions with greatest search volumes for both procedures are reported in Figure 1. Those searching for botulinum toxin most commonly searched for information on cost, side effects, cosmetic results, and reviews of the treatment, while those searching for hyaluronic acid explored differences between brands and formulations. Florida was identified as the state with the highest RSV for both search queries.

**FIGURE 1.** Visual representation of Top search queries, in which the size of each query's type is proportional to RSV for (A) [botox], (B) [Hyaluronic acid + Juvederm + Perlane + Restylane + Prevelle]. Heat map depicting search interest in (C) [botox], (D) [Hyaluronic acid + Juvederm + Perlane + Restylane + Prevelle]. Search volume for [Hyaluronic acid + Juvederm + Perlane + Restylane + Prevelle] was sufficient to generate RSV in only 13 states.



## DISCUSSION

Our findings validate the importance of Google Search as a resource for patients seeking dermatologic procedures and the utility of Google Trends as a tool for practicing dermatologists. Because of the anonymity of internet search, patients may search questions they are not comfortable asking their physician; therefore, data obtained from Google Trends is theorized to be more accurate than data acquired through survey based research.<sup>4</sup> Understanding the content of prospective patient's searches is important to tailor online material to better address their concerns, fill knowledge gaps, and address misinformation. Official organizations and individual dermatologists should utilize search engine optimization techniques to ensure site recognition by the Google Search algorithm and prevent patient exposure to less reputable resources. Google Trends is used to forecast demand for products outside the medical field, and our data suggests RSV may be used similarly to predict local demand within dermatology. To predict the number of procedures to expect for a coming time interval, an individual practice may use county-level RSV data to estimate the total number of regional procedures for said time interval. Historic data on the percentage of total procedures in the region performed by a practice could then be used to forecast practice-level procedure volumes. Understanding of future demand can be used to facilitate a practice's inventory management, staffing, and appointments.

## DISCLOSURES

The authors have no conflicts of interest to disclose.

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