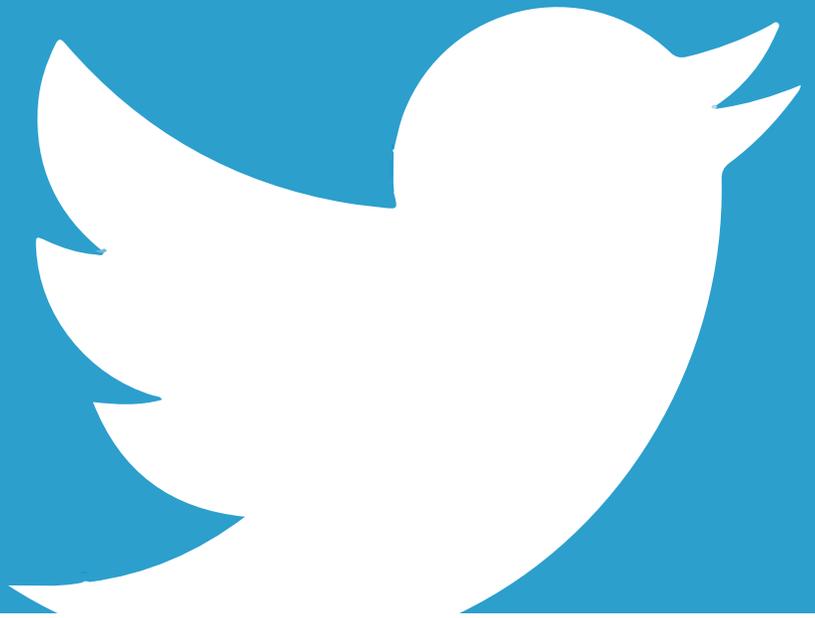# TRENDING:

#DocsOnTwitter

A comprehensive study tracking Twitter adoption and usage by medical professionals from 2006-2015

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ABSTRACT

Augustana University healthcare marketing students investigated how medical professionals utilize social media to further engage with their communities. The team selected Twitter as the social media network from which to collect data because of its popularity and ease of use. Twitter also offers an open application program interface (API) that allowed extraction of information from the user profiles and individual tweets. Individual Twitter users were identified as healthcare professionals by searching specific keywords such as physician, MD, chiropractor, and dermatologist within their profile. Up to 1,000 Twitter profiles were retrieved from 24 keywords. The last 3,200 tweets from the selected users were collected. A total of 3,378,285 tweets were analyzed for content, use of hashtags, mobile device use, frequency, longevity, medical relevance, medical specialty, gender, and approximate age. The deep web intelligence company, BrightPlanet, assisted in harvesting the data and running biometric recognition software. This is an important step in understanding how physicians can parlay the popularity of social media to share research with colleagues, connect with patients and prospective patients, and extend their personal and employer brands to increasingly information-hungry and interactive consumers.

INTRODUCTION

Dr. Drew, the board certified internist and self-declared addictionologist, is apparently addicting himself. He has more than three million followers on Twitter. Medical professionals such as Dr. Drew are beginning to utilize social media to engage with their fellow practitioners, patients, healthcare consumers and even fans. Through analysis of Big Data (more than 3.38 million tweets) drawn from carefully culled English-speaking physicians, our research team tracked how, how often, with whom, and how long social media engagement practices have been adopted. In an effort to better understand these physicians, we utilized biometric recognition software which looks solely at age and gender. We expected to find the following:

- **Medical professionals are not using Twitter for community engagement as extensively as many other industries due to HIPAA regulations, malpractice insurance, and its untraditional computer-mediated communication.**

- **Twitter usage is growing among younger physicians and younger followers.**

- **Physicians are using Twitter primarily to encourage prevention, educate followers, support the chronically ill, and promote company brand messages rather than to dispense medical advice.**

As healthcare marketing students at Augustana University, we planned and completed this social media research project in association with deep web intelligence firm BrightPlanet in an effort to better understand new marketing efforts in an era of mediated consumer engagement. BrightPlanet harvested Twitter data according to student-defined characteristics.

LITERATURE
Review

Social media, or content created and exchanged within virtual communities through the use of online tools, are used by billions to converse and connect (Eytan, Benabio, Golia, Parikh & Stein, 2011). Researchers have suggested health systems can utilize social media to build trust, make formidable organizations more approachable, and engage consumers (Understanding the role of the internet, 2010). Healthcare constitutes more than 17 percent of the U.S. gross domestic product (NHE Fact Sheet, 2013). While healthcare may be one of the nation's largest industries in terms of size and scope, it has slowly adopted information technology advances (Hawn, 2009).

Patients often first turn to the internet when looking for healthcare information or advice (Dellavalle, 2009). This fact illustrates the demand for physicians to have a social media presence. While other industries have largely adopted the use of social media, it is not as simple for the healthcare industry.

Marketing professionals and advertisers use social media to spread messages to followers, but physicians are bound by more regulations and oaths.

Some physicians have begun using social media sites such as Twitter in a similar way to spread public health messages to a younger demographic. However, potential users of social media in the healthcare industry are likely deterred by the challenges that arise with privacy concerns (Dellavalle, 2009). Other studies, such as the 2014 findings by Grajales, Sheps, Ho, Novak-Lauscher and Eysenback, have found privacy concerns to be less restrictive. "Numbers of privacy and confidentiality violations committed by physicians who use social media are small" (Grajales et al., 2014). This research shows the ongoing need for healthcare institutions to combat the fear of malpractice and legal issues through clear social media strategy.

Healthcare systems understand that social media has already become an extremely powerful way for healthcare systems to communicate, create brand trust and awareness, and help patients. Social media has assumed a larger role in how consumers manage their health.

Research shows people look up symptoms online before scheduling doctor appointments, and they share medical news and information frequently online (Eytan, Benabio, Golla, Perikh and Stein, 2011). The number of mentions for one company, Kaiser Permanente, in social media increased by almost 800 percent in the years 2005-2009, and social media has since been growing among businesses and consumers.

Despite challenges, physicians are using social media. According to Cooper, Gelb, Rim, Hawkins, Rodriguez and Polonec (2012), patients benefit from a physician's use of social media and other internet-based communication technologies through increased access to care and patients' perception of care quality. Internet-based technologies have the potential to reach a broad range of physicians and so do their messages. Cooper et al.'s study found physicians aged 35-44 years old had higher odds of reporting use of portable devices to access the internet and widgets than those younger than 35 years of age. Also, in 2011, 87 percent of U.S. physicians reported using social networking sites for personal purposes, while 67 percent use social media for professional purposes.

There is also great promise for social media in sports medicine. Work by George, Rovniak and Kraschnewski (2013) pointed out ways that social media could best contribute to medicine--improving communication with patients, enhancing professional development, and adding to a growing bank of research. According to the authors, one of the biggest areas of medicine that could see a positive impact from social media is sports medicine.

Overall, social media may not only link the public to healthcare professionals, but could also help them by focusing on a more team-based approach to healthcare by collaboration, which would be beneficial to doctors as well as the public.

METHODOLOGY

Data

In an effort to gain an understanding of how current medical professionals use social media, we selected Twitter as the most appropriate social media network to focus upon. The team arrived at the decision for the following reasons.

1. The ease of use of Twitter Data
Twitter is a microblogging social media network that allows users to share 140 character snippets of text. The shorter the tweet, the easier it is to understand and analyze. It also produces less noise when compared to social networking sites like Facebook, which allows longer, full-page posts, Instagram, which is focused on primarily images, and YouTube, which streams videos.

2. The open API that allows access to Twitter
Twitter also offers an open API that allows access to large amounts of data from user profiles and individual tweets which can be used for analysis. This is unlike Facebook's API that doesn't allow for data collection from individual users.

3. The popularity of the microblogging site
Twitter continues to be a popular microblogging site with 1.3 billion registered users and 320 million active users. Nearly 40 percent of Millennials in the U.S. have a Twitter account (twitter.com). The largest social media network in the world is Facebook with 1.59 billion monthly active users at the end of 2015 (newsroom.fb.com). LinkedIn, Pinterest and Google Plus round out the top five social media sites (ebizmba.com).

The Collection Process

To help with the process of the data collection, we deployed the efforts of Sioux Falls-based data collection and analytics company, BrightPlanet. We broke up the collection process into a two-step approach. The first step was to identify and target specific professional English-speaking individuals from whom we wished to collect tweets. Once the individual users were identified, the second step was to actually harvest those key users' tweets.

Finding Users

We needed to find a way to identify key users who were labeling themselves healthcare professionals on Twitter. To do this, the Twitter Search API was deployed. Twitter's open API, more particularly the API Call GET users/search, allowed for the automated querying and collection of users based off of keywords that matched their profile. This meant we could derive a list of keywords related to individuals we believed were representative. The following table contains the list of keywords queried directly into the Twitter Search API.

Board certified physician	Family physician
Chiropractor	Emergency medical physician
Dermatologist	Med Dr.
Doctor	MD (Doctor of Medicine)
D.O. Med	OB/GYN
DDS (Doctor of Dental Surgery)	Ophthalmologist[1]
DMD (Doctor of Dental Medicine)	Optometrist XX
DNP (Doctor of Nursing Practice)	Orthodontist
DPT (Doctor of Physical Therapy)	PharmD (Doctor of Pharmacy)
D. Chiro	Pediatrician
Dentist	Physician
Family practice physician	Practicing physician

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[1] The data collected for this keyword was not accurate, it was run through the Twitter Search API misspelled.

Finding Users (continued)

Each individual keyword allowed for the return of up to 1,000 Twitter profiles matching that keyword. This meant we received only a sample of the profiles that matched for the analysis. Additionally, a large number of profiles were false positives that included people who were not actually medical professionals. People identifying themselves as "Love Doctor" and "Dr. Who fan" are a few examples of individuals who showed up as false positives. We manually removed the false positives from the profiles which resulted in 4,526 unique Twitter profiles representing medical professionals actively using Twitter.

Twitter Collection

Once the Twitter profiles were identified, we delivered the profiles to BrightPlanet for collection of the actual tweet data. The Twitter Search API was once again deployed for the analysis using the GET statuses/user_timeline call to the API. This allowed for the last 3,200 tweets to be collected from each individual user through December 31, 2015. A total of 3,378,285 tweets were collected and analyzed from the user profiles. The following white paper relates data that sheds light into the use of social media by physicians as of the end of 2015 and later digs into the analysis of those 4,526 users and 3,378,285 tweets.

PROJECT
Findings

The data below illustrates major findings from the study. The following topics and graphs are listed in the order of most importance to least. All data collected from the study contributed to better understanding of current trends and uses of Twitter among professionals in the medical sphere.

Who is Using Social Media

Social media has changed the way we currently communicate. Social networks have overtaken the communication processes in nearly every industry to personalize messages, increase brand recognition, and increase contact with consumers, scholars, and colleagues.

There are many reasons medical professionals are and should be using Twitter. Thought leadership is a primary reason why professionals adopt Twitter, as it allows leaders to effectively communicate advancements in a particular field of study and can provide valuable information on emerging specialties or unprecedented research.

Medical professionals can also opportunize this platform to engage in and share their lectures and blogs to further their reach. Career growth can also be attributed to adoption of Twitter as it allows young doctors to learn more about specific disciplines and network with successful physicians in a certain area of study.

Twitter allows users to have individualized and personal interactions through engaging with their followers and helps medical professionals to connect in a unique way with their patients and colleagues. By being aware of different people's opinions through their online presence, doctors can better understand the patient to improve his or her experience. Additionally, adopting a platform such as Twitter will refine a medical professional's reach with patients beyond the walls of a hospital or clinic.

Although many benefits apply to the adoption of Twitter, it is not a streamlined process for many organizations, especially in the healthcare industry. HIPAA and doctor-patient confidentiality guidelines inhibit the adoption of Twitter due to employer liability suits. Damage to brand image and legal issues also serve as a barrier to employers encouraging employee Twitter usage.
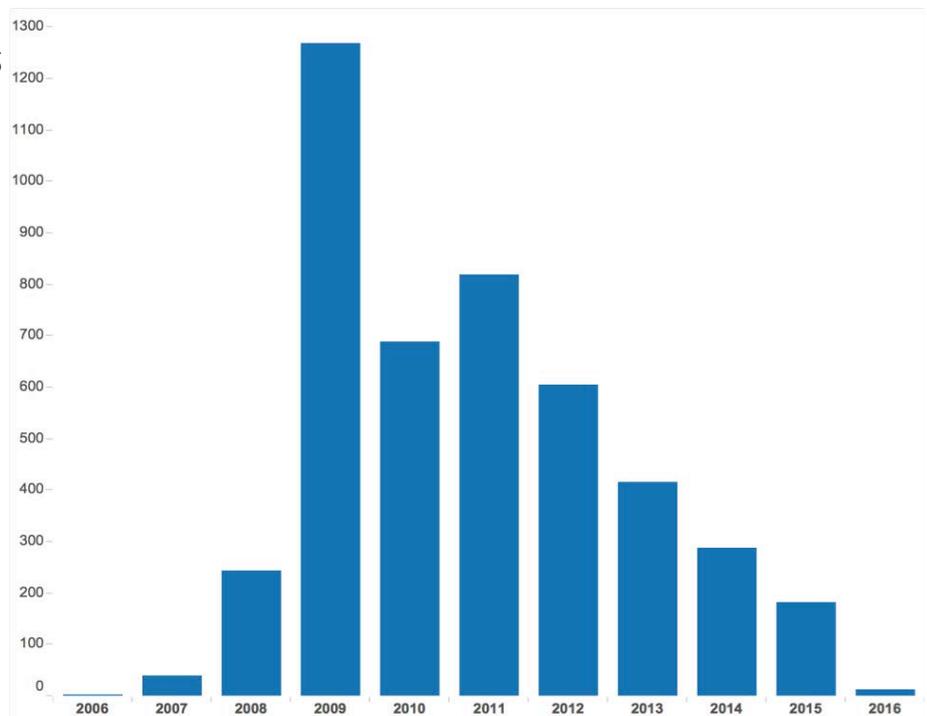
List of Doctors and Professions

We collected Twitter data from a variety of different medical professionals. To compare how different specialties use Twitter, we looked at keywords found within their biography description indicating their specialty. The top 10 are shown and the remainder or those who did not specify their specialty are placed in the null category.

Profession	
Medical Doctor	10,347,188
Pediatrician	3,319,792
Chiropractor	3,085,908
Null	2,901,767
Dentist	2,010,708
Optometrist	924,581
Dermatologist	715,299
Resident/Student	474,316
Orthodontist	337,105
Surgeon	208,675
Physician Assistant	12,524

Physicians Joining Twitter Each Year

The graphic below shows the trends of medical professionals adopting Twitter each year. The bar indicating 2009 shows that nearly 1,300 physicians joined Twitter that particular year. Twitter was introduced on March 21, 2006, and the significant growth indicates 2009 was a year that the platform became significantly more popular. The graph also shows a consistent decline in physicians joining the Twitter network since 2009, with an exception of 2011. The decline may be attributed to early adoption by younger physicians, which would mean many medical professionals already began using the platform before employing it as a strategic tool to reach specific audiences.

Top 10 Users

We were interested in understanding more about the physicians who used Twitter most extensively, so we compiled a list to show the top 10 users who have the most followers. As one might expect, all 10 of these users are publicly known figures; some are stars of television shows and others are world-renowned health experts. The number one user with the most followers is Dr. Drew with 3,183,017 followers and counting. He is an American board-certified internist, addiction medicine specialist, a media personality, and host of the radio talk show, Loveline. Dr. Drew uses his Twitter account for professional use, tweeting his opinions and advice, and engaging with his fans.

The next user on our list is Dr. Sanjay Gupta, trailing Dr. Drew with 2,031,428 followers. Dr. Gupta is an American neurosurgeon and a media reporter. He is best known as the chief medical correspondent for CNN and has won multiple Emmy awards. He also uses his Twitter account primarily for professional use, giving his opinions and medical advice.

The only female in our top 10 list was number nine, Dr. Jennifer Arnold with 262,852 followers. She is the co-star of the reality TV show, The Little Couple. Dr. Arnold is certified in pediatric and neonatal medicine and talks on her Twitter account about her family life along with advice and information on pediatric health, infertility, adoption and more.

After analyzing these users, it is interesting to see that only one of the top 10 users is female, compared to the majority of our 4,500 users being female. These findings will be elaborated upon further in the next section, Age and Gender. Another interesting piece of information we found is that of our top 10 users with the most

Screenname	Name	Followers	Following
drdrew	Dr Drew	3,183,017	511
drsanjaygupta	Dr. Sanjay Gupta	2,031,428	214
DrAsa	Dr Asa	1,031,019	3,637
alnagar80	Mostafa Alnagar	954,380	754
JP_LOKSATTA	Jayaprakash Narayan	569,778	88
PapaRandlicious	Randy Houska	355,656	586
DoctorChristian	Dr Christian Jessen	334,556	971
DoctorKarl	Dr Karl	292,844	38
JenArnoldMD	Jennifer Arnold, MD	262,852	1,877
mercola	Dr. Joseph Mercola	228,352	33,087

followers, eight of them are famous in the United States, the other two being known best in India and Egypt. Lastly, it is apparent that although these users have very high numbers of followers, they do not follow a high number in return. Most follow fewer than 1,000 Twitter users, with a few exceptions.
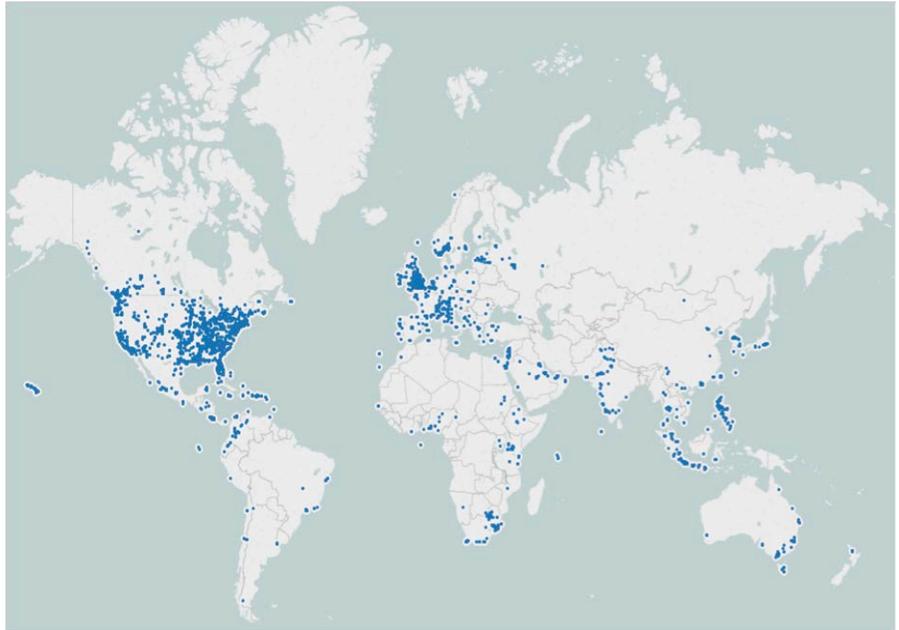
Age and Gender

Jamie Martin, data acquisition engineer at BrightPlanet, used Biometric Analysis, a recognition software, to assist us in estimating the age and determine the gender of our users. The software analyzed features of their user picture, and calculated the age and gender of that person. The software is not 100 percent accurate but there is confidence in the determination for at least 2,500 of the 4,500 users.

After running all 4,500 users, it was found that 81.12 percent are female, a surprisingly high percentage, and only 20.07 percent are male. We also found a large number of the active Twitter users are 23 to 25 years old, which is expected because of the popularity of social media within the Millennial generation. The median age, where the data peaked, is in the mid 40s. The oldest estimated age of one physician using Twitter is 79.

Gender Breakup

20.07%

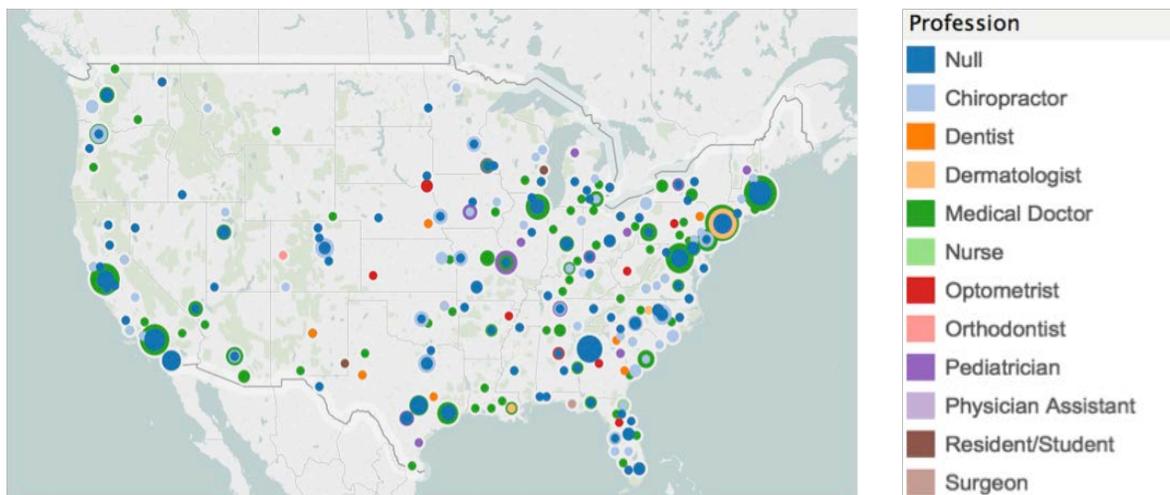81.12%

Age and Gender Makeup
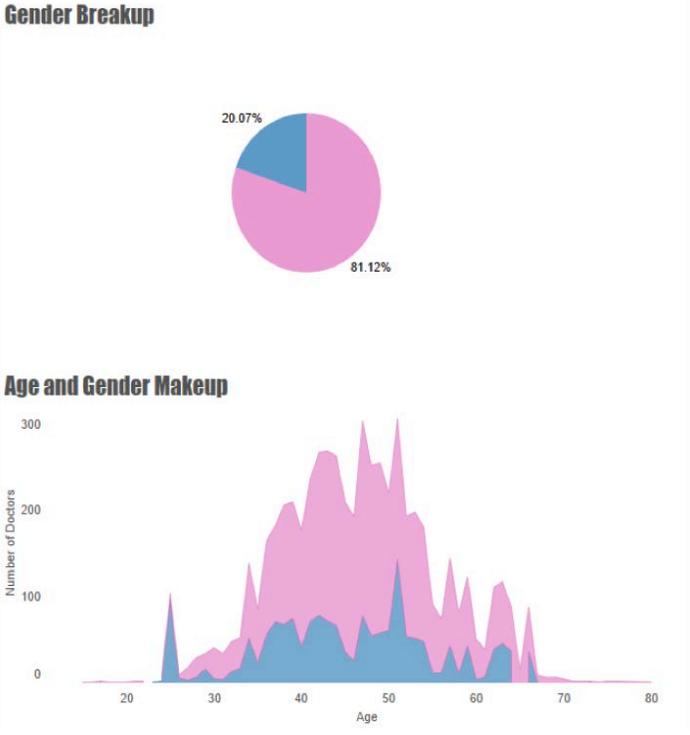
Global Location

The world map displays the stated location of our Twitter users around the globe. This data is gathered from each user's Twitter profile description, where people have the option to include where they live. As we expected to find, there are a large number of tweets on the coasts of the United States and in Europe. We attribute this to a larger population in these areas. Twitter is currently blocked in mainland China, explaining the large gap of tweets across the country.

US Location Professionals

Profession
- Null
- Chiropractor
- Dentist
- Dermatologist
- Medical Doctor
- Nurse
- Optometrist
- Orthodontist
- Pediatrician
- Physician Assistant
- Resident/Student
- Surgeon

As the following map depicts, many of the harvested tweets originated in larger cities, and along the coastlines. The size of the dot indicates the number of tweets that came from a specific location and the color represents the healthcare professional's area of expertise. In order for any harvested tweet to appear on this map, it was necessary that location service was enabled on the device used to send the tweet.

Compiled Tweets Per Quarter

As indicated by the data, the number of tweets has steadily increased per quarter since Twitter's inception in 2006. The graph below portrays the compiled tweets per quarter with dark blue as quarter one and yellow as quarter four.

Growth patterns show year-over-year growth that has consistently ranged from 20-50 percent growth in tweets per year. However, the most growth was seen in 2009 with a 95 percent increase in content from 2008. This significant increase can be attributed to the rapid expansion in adoption of Twitter by medical professionals in 2009. As more medical professionals join the network, we anticipate compiled tweets will continually rise.
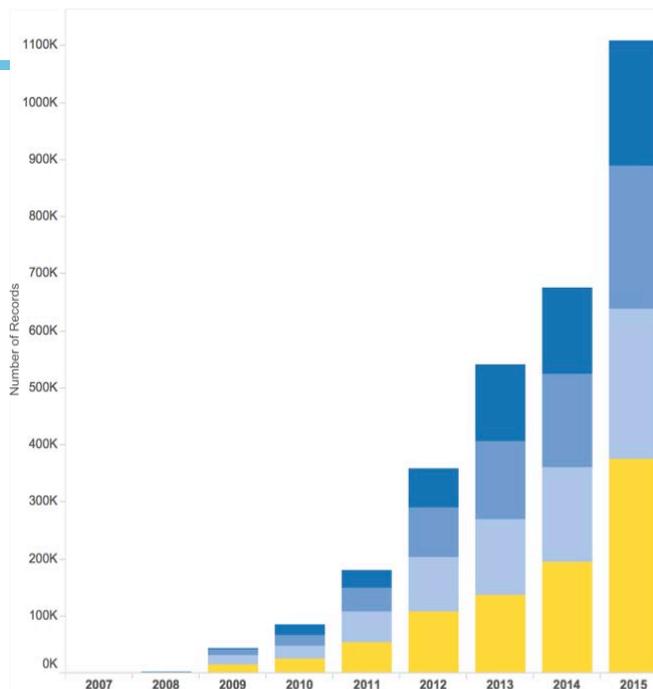
Tweets Throughout the Week

Analysis of Twitter usage during the week illustrates trends in both the amount of tweets per day and engagement patterns from followers. Tuesday, Wednesday, and Thursday proved to be most popular for medical professionals to post content. Wednesday garnered the most tweets with 522,773 and was closely followed by 521,604 and 517,744 on Thursday and Tuesday, respectively. Medical professionals posted the fewest tweets on Saturday and Sunday.
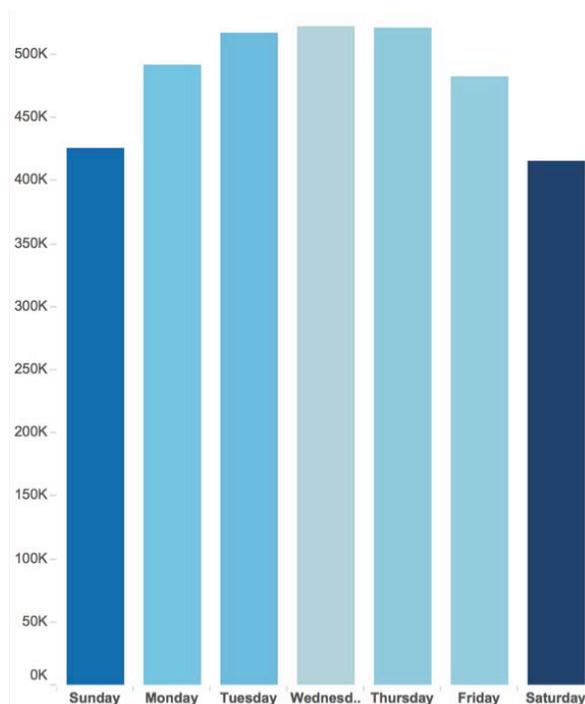
Engagement patterns of Twitter followers during the week aligned differently than the trends above. The most engagement occurred on Saturday and Sunday and weekdays received less interactions from the audience. Therefore, physicians and their followers are utilizing the platform at contrasting times. It is likely that catering content more specifically to the schedule of followers will increase audience engagement and interactions.
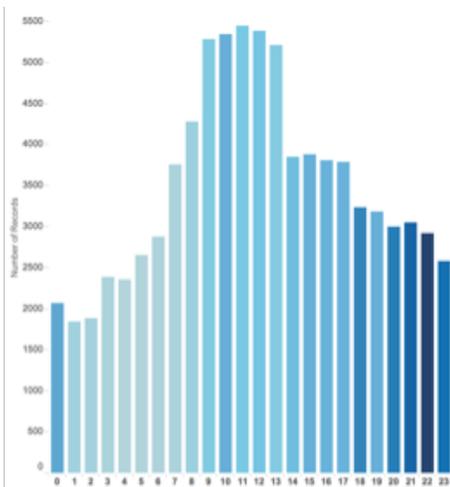
Tweets Throughout the Day

The next graphic we analyzed shows tweets throughout the day. We looked at the different times of day that physicians are tweeting and also how much engagement each individual tweet is receiving. On the graph below, the higher the bar, the more medical professionals who are tweeting at this time. The darker the color of the bar, the more engagement the tweets have.

We found that the majority of healthcare professionals are tweeting in the afternoon hours, spread out between 9 a.m. to 3 p.m. (which falls within a typical work day). Individuals receiving the most engagement with their tweets are tweeting in the early morning up until 6 a.m. and later at night, starting around 8 p.m. It also appears that followers may be checking and engaging in tweets that are sent over work breaks. For example, there is higher engagement, seen in the darker blue color around 12 p.m., which is when many people take their lunch break.
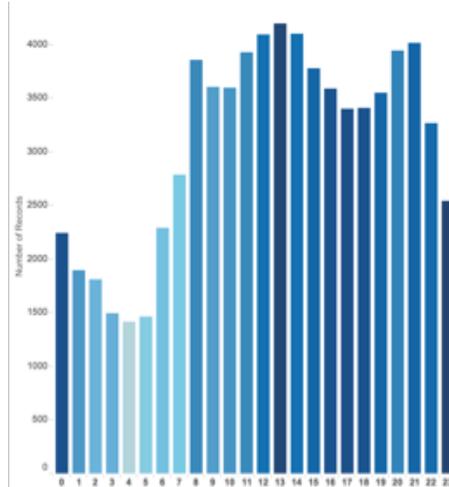
We find this data to be very beneficial to healthcare marketers trying to reach their audience most effectively. Although it is easiest to tweet and be active during the workday, they will better reach and engage with their patients and followers in the morning or evening hours.
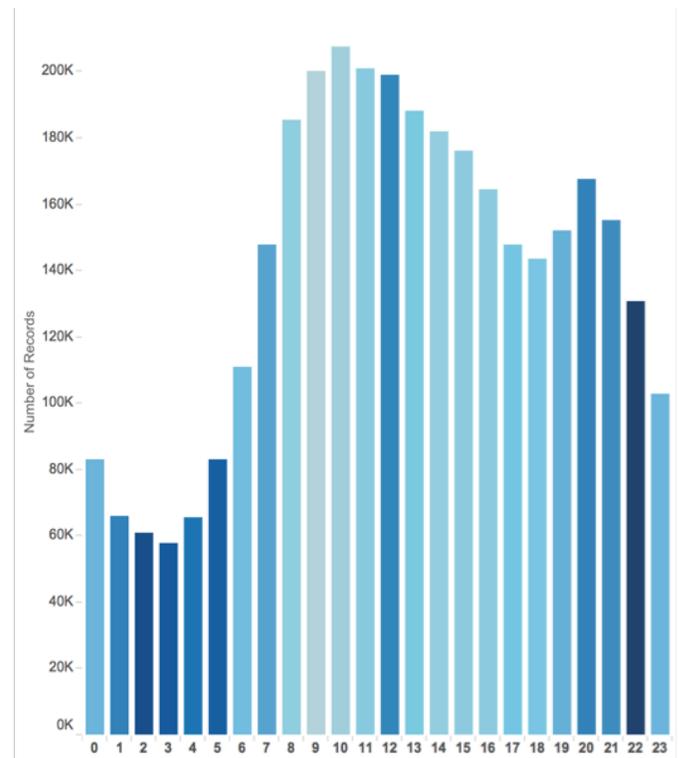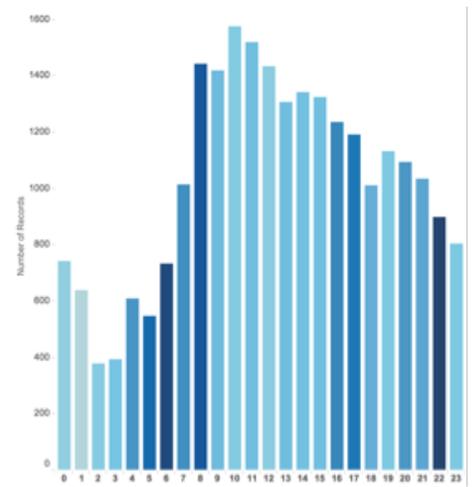
# Tweets Throughout the Day: Per Specialty

Dermatologist   Orthodontist   Surgeon

After looking at the tweets throughout the day from our compiled list of around 4,500 users, we looked more closely at three specific specialties: Dermatologist, Orthodontist, and Surgeon. Data showing tweets throughout the day from these three professions varied significantly from the original graphic. Dermatologists were tweeting the most from 9 a.m. to 1 p.m. and were getting the most engagement solely in the evening hours after 6 p.m. Orthodontists varied the most from the original, as they are seen to be tweeting pretty consistently from 8 a.m. until 10 p.m. and are receiving a significant amount of engagement throughout the day. The least engagement between orthodontists and their followers occurred between 1 a.m. to 7 a.m. Lastly, the surgeon graph shows different Twitter behavior data as well. They are tweeting the most from 8 a.m. to 3 p.m., but have the most engagement from 4 a.m. to 8 a.m. and only slightly in the evening, primarily around 11 p.m.

Most Common Hashtags
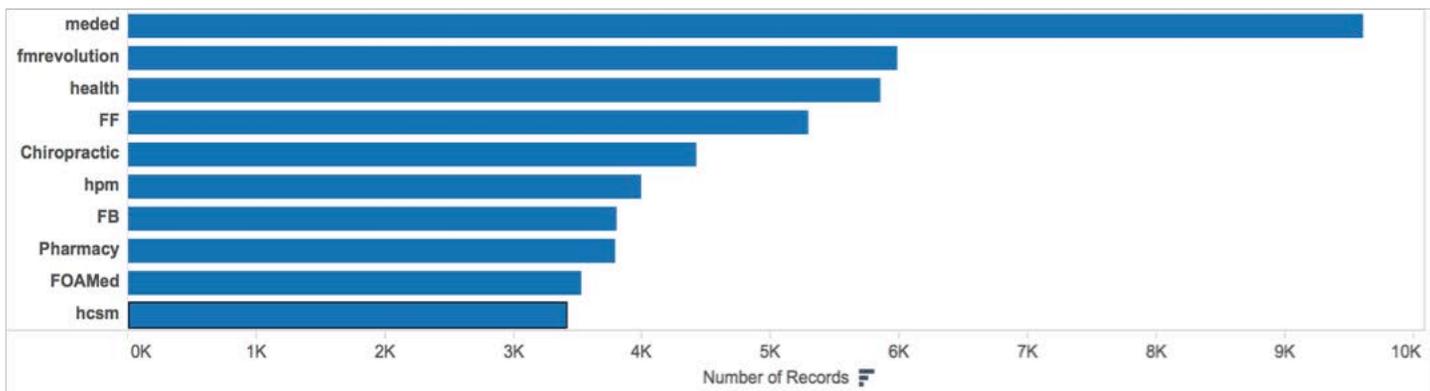
We were interested in the topics most frequently discussed by our physicians on Twitter. Rather than reading over three million individual tweets, we chose to examine the use of hashtags as a proxy for content. Our data retrieval only allowed us to analyze the first hashtag used in a tweet; if a user had a collection of hashtags placed at the end of a tweet, only the first one was included in our analysis. Shown are the top 10 hashtags used by our physicians. Only two specialties are included in this list–chiropractic and pharmacy. Contrary to what we expected, our physicians are not tweeting about specific illnesses but rather focusing on broad topics such as #health. Our selected physicians are not advocating for a specific drug or medication either.

 Looking more closely at the top hashtags, #meded is the most commonly used hashtag. This refers to a tweetchat that occurs weekly on Thursday evenings and consists of a discussion of different issues relating to medical education. This chat began June 2, 2011. More than 9,600 of our collected tweets used this hashtag. The second most common hashtag from our collected tweets is #fmrevolution. This stands for Family Medicine Revolution. Nearly 6,000 of our tweets used this hashtag. Family Medicine Revolution is an organization whose mission is to make health a primary focus by increasing awareness and respect for family medicine. Others included in the list include #FF (Family First), #hpm (a tweetchat about hospice and palliative medicine), #FB (Facebook), #FOAMed (free open access medical information), and #hcsm (healthcare communications and social media).

Most Common Mentions
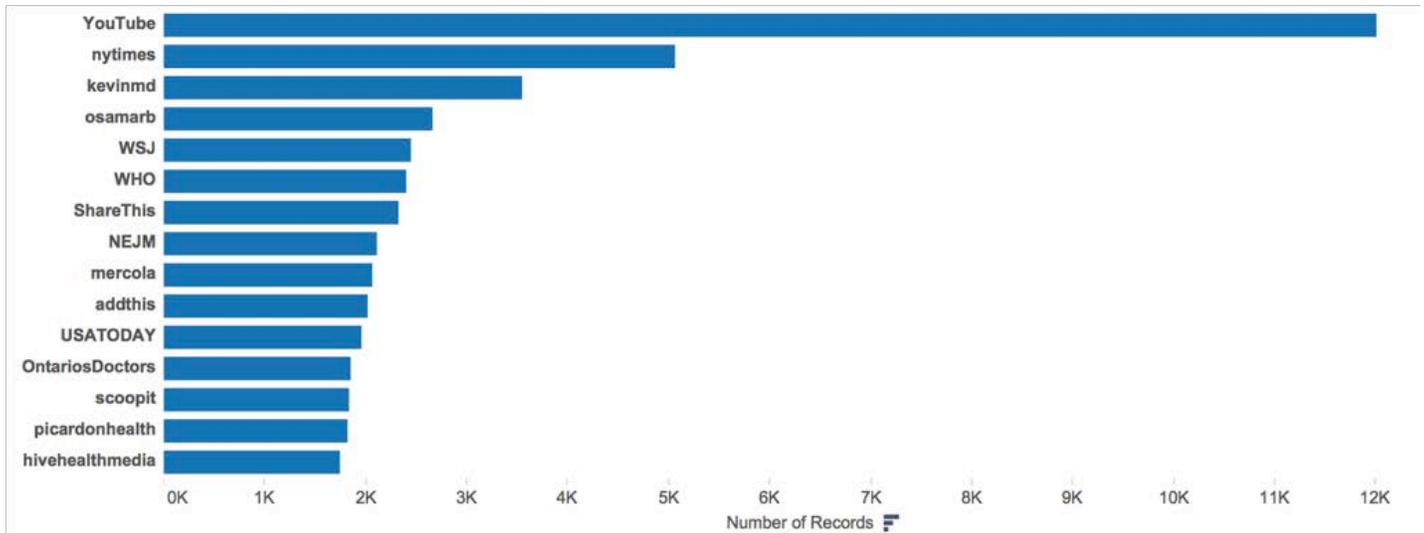
Another piece of data we decided would be beneficial to collect is the most common mentions in the harvested tweets. A mention occurs when a user tweets something out and tags another account using the "@" symbol. Out of the 3.38 million tweets we collected, we compiled a list of the top 15 most popular mentions. Of these 15, the most popular mention was YouTube with over 12,000 individual mentions. The second most popular was New York Times, or @ nytimes, with about 5,000 mentions. Farther down the list, we found Ontario's Doctors to be prevalent with just under 2,000 mentions. This mention stood out from the rest because it is not a popular person, business, or website. After looking into it, we found that there has been a large debate over the Ontario government cutting funding for the health care services their doctors provide. Because so many people oppose these government cuts,it has become a popular Twitter topic and has made an impact on our top 15 list.

Retweets vs. Original Content

This graph compares the number of retweets to original tweets. This method was used to assess whether medical professionals were sharing their own ideas or passing along information shared by others. Nearly 43 percent of our collected tweets were retweets and 57 percent were original tweets created by our users.
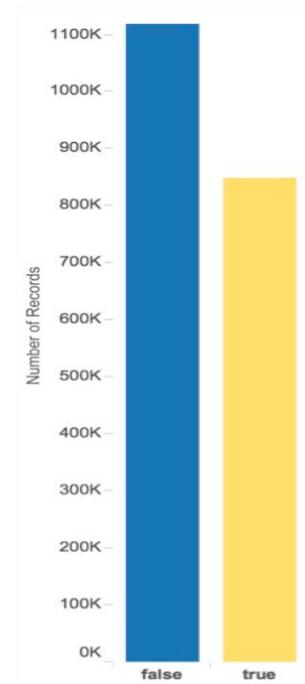
Most Common Devices
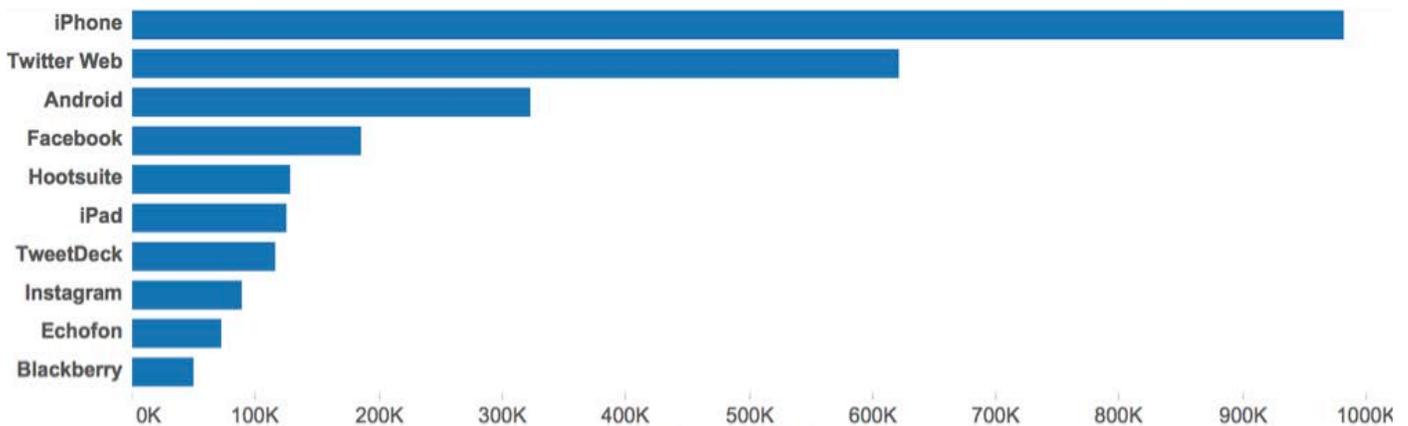
When analyzing the most commonly used devices amongst medical professionals, we found that the iPhone was the most popular device to tweet from. Many medical professionals are also tweeting directly from their web browser. Over 300,000 tweets came from Android devices.

CONCLUSION
& Implications

Results from our study showed that while medical professionals are using Twitter to engage with their community, 89 percent do not identify with their medical institution. We attribute this to an overall lack of health organizations supplying physicians with social media guidelines. It is also possible that physicians wish to extricate their professional opinions from those of their employers. Medical professionals also held disclaimers in their Twitter bios, such as: "views are my own" or "use the advice as helpful instead of prescriptive." We also found that not all Twitter accounts were used for only professional purposes. More often than not, physicians also tweeted about their interests, which included topics like politics or humanitarianism. We discovered that medical professionals also tweet amongst themselves for educational purposes.

As we had predicted, Twitter use is growing but not in the ways we had expected. From our study, we found stunted growth in Twitter since 2011 with a 95 percent increase from 2008 to 2009.

It is our belief that the amount of users has decreased due to early adoption among physicians in Twitter's early years.

However despite the decrease in adoption rates, Twitter content has continually risen since 2007. This means the amount of content produced by each medical professional has increased. It is our belief that physicians have realized the connection Twitter offers to their community, which explains the increase in content, interaction, and followers. Additionally, the doctors found to be tweeting most often were women in their forties. We expect that Twitter content will continue to rise as medical professionals realize their content reach within their community.

The hypothesis that medical professionals use Twitter to encourage prevention, education, and promote brand messages rather than give medical advice is correct. The majority of Twitter users were discussing new breakthroughs in research and connecting with other medical professionals. However when we looked more closely at the 10 most popular users, we found these medical professionals were more likely to dispense medical advice within their specific discipline than less-followed doctors. For example, Jessica Arnold is a neonatal doctor and tweets regularly about fertility, adoption, and pediatric health. Another note about the top 10 users is that these professionals also engaged their celebrity community in some way.

Finally, our research supported the fact that not all medical professionals are tweeting at opportune times to best engage with their audiences. A large discrepancy exists between when individuals are engaging with tweets and when physicians are actually tweeting.

In order to boost engagement rates, it is our recommendation that medical professionals tweet during the day from 9 AM to 3 PM with an emphasis around noon. If physicians are hoping to further engage their communities, some adjustments should be made to their content schedule. There are multiple free tools that allow users to schedule social media posts. We also found the majority of medical professionals from the study have more followers than those they follow. To better engage with the community, we also recommend these doctors follow more relevant doctors in their field to engage with them.

Future Research

Future considerations for the continuance of the research set forth in this study are below:

- We recommend tracking Twitter adoption and usage from a longitudinal perspective. For this particular study, we focused on domestic Twitter usage of physicians by limiting harvested tweets to English, but a comparison with a global perspective would provide more data.

- Another recommendation is to individualize the studies to learn more about certain disciplines. By narrowing the focus, more information and trends may be gathered to provide specific insight to a certain medical field.

- A map of users in the United States will also offer more insight into the pockets of Twitter users across the nation. With this information, there would be a clearer understanding of the trends in geographic location from our data especially if there are specific infectious disease outbreaks or localized health concerns.

- Finally, a case study is recommended to identify the promotional strategy and content used by one of the top 10 Twitter users from this study. Information derived from a case study could assist content strategy decisions for other professionals in a specific discipline.

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