Studying the Way People Rate Their Physicians *Online*

[Extended Abstract]

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1. ABSTRACT

As healthcare information and records of the patient experience in the modern era are increasingly shifted to a digital form, the number of people who look online for insights into their healthcare provider is steadily rising. 72 percent of internet users look online for healthcare information, and a fifth of those look for specific doctor or treatment information [**?**]. This paralleled by a large growth in the amount of people who write to online sites in order to provide reviews and ratings of their doctors. With the effortless access to knowledge and communication constantly at one's fingertips, online reviews rival other information sources as a supplier for candid doctor evaluations and give the reader an idea of what to expect from their visit. However, these reviews are a record of patient satisfaction, and investigative analysis is needed to determine how they relate to experience, health outcomes, gender, location, and type of healthcare provider.

In order to better understand this issue, we chose to investigate reviews from Urologists and Obstetric/Gynecologists. In order to target male-centric and female-centric health conditions, we focused on the domains of prostate cancer and obstetric care. Within obstetric care, the focus was on maternal mortality. The rate of maternal mortality has increased by 50 percent in the last fifteen years; the United States is one of very few countries in the world where the rate is currently increasing, and has one of the highest maternal mortality rates of all developed countries [**?**]. Prostate cancer is the most common cancer with a rate of 95.5 cases per 100,000 and second leading cause of death among men in the United States [**?**]. Therefore, it is paramount to better understand the issue, and an investigation of reviews and patients' perspective of their experience is crucial to a well rounded and thorough comprehension. Although patient satisfaction is more closely correlated to a doctor's interpersonal manner than health outcome and mortality rates, it may still reflect a root for the core of the issue [**?**]. Higher patient satisfaction is tied to better adherence and health outcomes, so those patterns may still be reflected in data from online reviews and ratings [**?**].

This investigation involved the analysis of ? urologist reviews and 4828 Ob/Gyn reviews from states with the highest and lowest prostate cancer and maternal mortality rates pulled from Google Reviews. To obtain these reviews, we utilized the Google Search and Google Places Details APIs to find healthcare providers that fit our description in each area and then collected any reviews written about them. By employing Text Analysis Markup System (TAMS), we were able to qualitatively analyze these reviews for sentiment and semantic content, finding trends dependent on various demographic factors along the way. Additionally, we performed quantitative analysis on the doctor ratings to better understand the patient experience and the factors it is affected by. We found that states with the highest prostate cancer mortality rates had less health care provider information than states with the lowest prostate cancer mortality rates.

2. INTRODUCTION

Online reviews are becoming more heavily ingrained as a cornerstone for facility evaluation in modern culture. They help prospective patients choose a suitable physician and provide patient perspective for providers, opening a dialogue that can illuminate and improve patient experience [**?**]. However, some health care providers argue that online reviews do not accurately reflect surgeon quality [**?**]. Whether or not patient satisfaction and the subsequent online reviews are merited, they cast insight into the mind of the patient and can affect the public image of an institution or doctor. Therefore, it is necessary to examine how differing outcomes and demographic factors affect ratings and reviews on a broader scale. Thousands of online reviews from the Google Places API were analyzed to better understand the patient and physician factors that affect patient satisfaction. Reviews were collected from the 10 states with the highest and lowest maternal mortality rates for Ob/Gyns, and the 10 states with the highest and lowest prostate cancer mortality rates for urologists in hopes that correlation between these outcomes and satisfaction would be present in the reviews. Qualitative and quantitative analysis allowed the conclusion that ... to be reached.

Researchers who have analyzed online ratings of health care professionals have found that it is difficult to identify an actual experience base on a review [10]. With the exception of papers such as [8, 9], most research on health care pro-

fessional ratings have not documented the locations where the reviews were collected. As this study takes location into account, it helps to further insight into the field.

By studying the way people rate their health care providers online we were able to conduct a qualitative analysis of how patients perceive their care. We built a work flow that utilizes APIs to collect, store, and analyze health care provider reviews. The research will also help to figure out the relationship between a patient's treatment and their willingness to be diagnosed again.

3. RELATED WORK

Online health care provider rating websites play a vital role when it comes to choosing a suitable health care provider. [4]. A study by Emmert showed that patients are highly influenced by the information presented on an online rating site [2]. However, whether patients should be able to review their doctors online is still debated; some physicians argue against the simple reviews in favor of more concrete metrics [11]. Further complicating the issue, there is no way to tell if a review is posted by a real patient or merely someone who wants to sabotage the physician's image [7]. Even if the review is legitimate, there is no guarantee that it accurately reflects the quality of the health care administered [11]. Nevertheless, policy makers believe rating websites foster transparency in the health care sector and approve of their general use [6].

Physicians don't have as much to fear from online review sites as they might presume; studies show that the vast majority of ratings are positive cite. Researchers analyzed reviews for 23 health care providers in 25 major U.S. cities from 10 of the most used doctor rating sites based on Google trend data and found that more than 65% of the reviews were positive [8]. People who write reviews online are more educated, younger and healthier than those who don't [9]. When it comes to health care providers, younger physicians without malpractice claims and physicians who graduated from top -50 medical schools had somewhat higher ratings then the other physicians [6]. Rosenbaum found that negative reviews can adversely impact the practice of highly qualified cardiologists [10], thus review accuracy and ratings are important to patients *and* health care providers.

The following tables represent the work that has been done so far by other researchers in this field. We found out that most of the researchers used websites like Yelp, RateMd, and Healthgrades to analyze the ratings and reviews of health care providers. Some researchers conducted cross sectional surveys to form their database, whereas others used data from non-profit news room like Propubica. Most researchers conducted both qualitative and quantitative analysis, and few performed exclusively qualitative analysis. Many papers failed to document their review collection process. Additionally, most collected reviews for physicians overall rather than a specific specialization. All data is included in the tables below.

4. METHODS

We shortlisted a few websites as our possible sources of reviews. After brief investigation, we selected Google because in comparison to other websites it had a little restriction on providing its data through its APIs. The collected reviews were arranged systematically and qualitatively analyzed using TAMS(Text Analysis Markup System).

4.1 Review Selection

We selected a women's health issue and a men's health issue that was intensely episodic in nature. In addition, the care would be personal and require a hospitalization with invasive procedures.

4.1.1 Prostate Cancer

With an average of about 172,258 new cases each year and being the second leading cause of cancer death in men in United States, we decided to find out if there is a relation between the reviews of Urologists and health outcomes in different locations. [3].To further investigate this we decided to use CDCś prostate cancer statistics to select the states with highest and lowest prostate cancer mortality rates. By using the reviews posted by patients in those states we were able to find how patients perceive the health care they receive. Mississippi has the highest, 24.8 per 100,000 and Hawaii has the lowest, 12.1 per 100,000 deaths due to prostate cancer. Five states with highest and Five states with lowest prostate cancer mortality rates were chosen for the research.

4.1.2 Obstetrics

The United States has one of the highest maternal mortality rates for a developed country in the world [**?**]. In order to further examine how these rates were affected by the patient's perception of their treatment, we used the CDC vital stats mortality database to find the states with the highest and lowest maternal mortality rates [**?**]. Massachusetts was the lowest with a rate of only 5.6 deaths per 100,000, while New Jersey had the highest maternal mortality rate; 30.2 [**?**]. Due to the two states drastically different rates but close geographical location, they were chosen for further review.

We then used the Google Places API to systematically search for Ob/Gyn's throughout the state by using a variety of latitudes and longitudes with a 10,000 meter radius. We then accessed the details of the locations, including reviews, for each of the doctors.

4.2 Data Collection

Our research is solely based on diseases like Prostate cancer and maternal mortality that are specific to one sex. Google allows its user to pull 5 reviews for each business using its APIs. We used Google places API to find the place ids and we further used Google place details API to get the ratings and reviews of specific locations represented by the place ids [1]. A python script was used to pull the ratings and reviews of health care providers and write them in a csv file. Scripts were written in such a way that they would only pull the information of those health care providers with at least one rating and were of the the desired specialty.

4.3 Data Analysis

Qualitative Analysis. We developed a code book to analyze the collected reviews. Codes were divided into two parts regular codes and context codes. Context codes are further

Paper	Google	Facebook	Yelp	RateMD	other
Kadry et al. [8]			*	*	healthgrades,vitals, checkbook, angieslist, ratemd
Lopez, et al. [9]			*	*	
Gao et al. [6]				*	Physician's database of Virginia
sciencedaily et al [4]				*	vitals, health grades
Emmert et al. [2]					cross-sectional survey
Sorrel et al. [11]			*		
Jain et al. [7]					vitals
Gebauer et al			*		propublica
Rosenbaum et al. [10]					probublica
Fox Fox et al [5]					

Table 1: Sites Used

Paper	Qualitative Analysis	Quantitative Analysis	API	Web Scraping
Kadry et al.[8]	mostly positive ratings	average rating = 77%	-	-
Lopez et al. [9]		61% positive and 39 % negative	-	-
Gao et al. [6]	most reviews were positive	46% got 5/5 12% got below 2	-	-
sciencedaily et al. [4]	female surgeons and surgeons with affiliation gor good ratings		-	-
Emmert.[2]	more people are using doctor rating sites in Germany	23% of internet users look for physicians online		
Sorrel et al. [11]			-	-
Jain et al. [7]	most people are positive on using internet for health purpposes		-	-
Gabeuer et al.	physician rating sites should be more systematic		-	-
Rosenbaum et al. [10]	there is no transparency in online rating sites		-	-
Fox et al [5]	positive	72% of internet users use internet for health info	-	-

Table 2: Type of Analysis

website	Real Name	Pseudo name	Location	Age & Past Reviews	Gender & Pictures	Date reviewed
Yelp	*	*	*	-	*	-
Google	*	-X	X	X	*	-
Ratemds	X	X	X	X	X	X
Healthgrades	X	X	*	X	X	X
Angieslist	X	X	X	X	X	X
Facebook	*	-	*	-	X	

Table 3: Reviewer Data by API where * indicates most likely available; - indicates may be available; and X indicates not available

website	Doctor Name	Location	Edu History	Star Rating	Review Text	Reviewer Name	Review post Date	Reply to Review	Liking/ Useful	API
Yelp	*	*	X	*	*	*	*	-	*	*
Google	*	*	X	-	-	*	*	-	-	*
Ratemds	*	-	*	*	*	*	*	-	*	X
health grades	*	*	*	*	*	*	*	-	*	X
Angieslist	*	*	X	*	*	X	*	-	X	X
Facebook										*

Table 4: Review Data by API where * indicates most likely available; - indicates may be available; and X indicates not available

paper	no.reviews /reviewers	no.doctors	rural	sub-urban	urban	speciality
Kadry et al[8]	4999 reviews				*	23 specialities
Lopez et al [9]	712 reviews	445			*	
Gao et al [6]		18,174				fam/ped, ob/gy, surgery, hospital, other
Science daily et al [4]	2,813 reviews	275				sports medicine surgeons
Emmert et al. [2]	3052 reviewers.					
Sorrele al. [11]						
Jain et al. [7]						
Gabeuer et al.						
Rosenbaum et al. [10]						cardiologists
Fox et al. [5]						

Table 5: Number of Doctors and Demographics

divided into two parts regular context codes and universal context codes. Regular context codes are the codes that provide an insight of the scenario of the review where as the universal context codes give a notion of the whole review. Regular context codes represent the reviewers opinion. Just for example if the review says, "Love the staff and atmosphere here. The doctor is very professional, yet able to relate to the patient" then we code it as "positive, professionalism and helpful staff". We added a new code when we came across a review that was not covered by the existing code. This whole process is performed in TAMS.

STILL TO FILL IN

Quantitative Analysis

- (Possibly use NLP)
- We use Tableau to visualize the quantitative data we collected. [still to fill in]

5. LIMITATIONS

- Sampling Issue - worse care associated with income and possibly this demographic is not online
- Sampling Issue - some areas, (if we go with erectile dysfunction), are for higher socioeconomic status groups; some health outcomes may be impacted by socioeconomic status (e.g., people only go to the doctor when they are really sick and, in some cases for cancer, this may be too late for treatment. Having fewer than four pre-birth appointments, among other things hard for low income women, is tied to a higher maternal mortality rate.)
- Among all the reviews of an urologist, very few of them were posted by the patients who had issues related to prostate cancer. Most reviews were posted by the people who have been to an urologist but not necessarily because of prostate cancer. Similarly, many of the reviews for Ob/Gyn's refer to checkups, cancer checks, birth control prescriptions, and other items besides birth.
- `www.reviewtrackers.com`, a website that monitors reviews from multiple sources and provides the ability to easily respond to reviews, notes that the company can "improve your reviews by 400%", thus positive reviews may not necessarily indicate a positive experience. For example, `www.reviewtrackers.com` notes HealthGrades, Vitals, and RateMDs are clients.

6. FINDINGS

We were able to collect 3217 reviews for prostate cancer and [FILL IN] reviews for maternal mortality from the states with highest and lowest maternal mortality rates in the specific headings. We obtained highest, 800 reviews from Georgia and lowest, 15 reviews from Delaware for prostate cancer where for maternal [FILL IN]. From 3217 reviews 1531 reviews that were of other specialties than urologists were removed.

7. RESULTS AND DISCUSSIONS

7.1 Results

Based on our current results(it might be changed as we go further in our research) we are certain that the health care provider reviews are independent to health outcomes. We support it by the following facts. Lets take an example of Mississippi, where the prostate cancer mortality rate is highest among all states. If we are just to look at the fact that, Mississippi has the highest prostate cancer mortality rate in the US then we can assume that health care providers in that state get the worst ratings but our data shows that that health care providers in Mississippi have the highest mean rating of 4.1/5 stars. Let's take Hawaii, which has lowest prostate cancer mortality rate among all US states. If we are just to look at the fact that, Hawaii has the highest prostate cancer mortality rate in the US then we can assume that health care providers in that state get the best ratings but our data shows that that health care providers in Mississippi have the second lowest mean rating of 3.5/5 stars Using the data collected we will find out the relation between the reviews posted by patients and health outcomes. We are still yet to analyze the data in depth. [FILL IN]

7.2 Discussions

- (YET TO IMPROVE) We are still in the process of data collection. At first we collected few hundred data just using google places API but now we are using latitude/longitude to collect reviews and rating from the google.
- We are running little late in data collection process.
- As soon as we finish data collection we will start coding reviews.

8. REFERENCES

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State	Google	Yelp	State	Google	Yelp
Mississippi	17		Arizona		
Louisiana	16		Wyoming		
Alabama	14		North Dakota		
Georgia	45		Missouri		
South Carolina	41		West Virginia		
Oklahoma	15		Connecticut		
Nevada	43		Alaska		
Idaho	21		Florida		
Nebraska	6		Delaware		
Maine	14		Hawaii		

Table 6: Total number of reviews by website and states[STILL TO FILL IN]

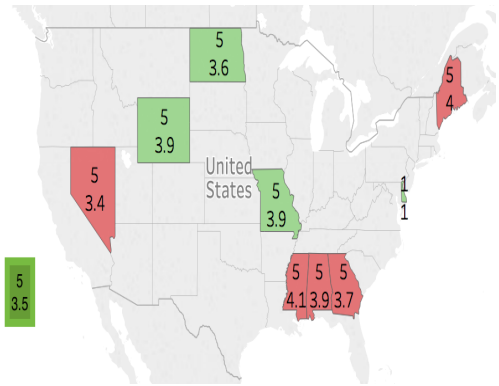

Figure 1: Top five states with the highest and lowest prostate cancer mortality rates in the United States.

State	PCMR	State	PCMR
Hawaii	12.1	Mississippi	24.8
North Dakota	12.7	Nevada	23.5
Delaware	15.4	Maine	23.2
Wyoming	16.5	Georgia	22.8
Missouri	17.2	Alabama	22.1

Table 7: States with highest and lowest prostate cancer mortality rates where PCMR represents Prostate Cancer Mortality Rate per 100,000 people.

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