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ABSTRACT

The purpose of this research is to explore to what scale hospitals are adopting social media and implementing it in accordance with hospital characteristics. We reviewed hospitals' social media activities on social networking sites such Facebook, Twitter, Instagram, and YouTube. We studied the 912 hospitals in the Midwest region reported in the 2015 American Hospital Association Annual Survey dataset. We reviewed each hospital's social-networking page to understand the scale of social media adoption relative to the hospital's characteristics such as bed count, state, ownership type (control), and specialty (service). We also considered whether the hospital is in a network and whether it is physician-owned. We determined the hospital's degree of social media usage through data on user activity from each social-networking platform. This data includes likes on Facebook, followers on Twitter and Instagram, and subscribers on YouTube. More than 80% of the hospitals in this study have a presence on at least one social-networking website; however, utilization depends on many factors of the hospital's characteristics. We have observed that hospitals in Ohio, government-owned hospitals, and children's specialty hospitals with a higher number of full-time registered nurses have a higher degree of social media utilization.

Keywords: social media, adoption, utilization, hospital

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INTRODUCTION

Almost 79 percent of people in the United States are active on the social-networking website Facebook (Greenwood et al., 2016). Considering the number of people on social networking sites, many businesses prioritize having a presence on these platforms to reach potential customers and build strong relationships with them. Hospitals can follow these strategies too. Social media can assist hospitals in reaching patients and providing up-to-date healthcare information and news (Glaser, 2016). Social media websites can also aid hospitals in appreciating staff, promoting health services and products, and gathering opinions from patients (Kordzadeh, 2015). Adopting a plan to be active on social media platforms would increase a hospital's market share and popularity and provide an opportunity to develop a healthcare agenda. Online health groups and communities created by the hospital would be responsible for content. This whole process would not cost hospitals anything. While hospitals cannot have complete control over the discussions and comments on social media, they can direct the conversation through their presence and content.

Audience Engagement

The relationship between hospitals and patients starts when a patient is logged into the hospital records and ends when he or she has finished treatment. Nowadays, the relationship continues as the patient checks in to the hospital on its social media website (Thielst, 2011). When a hospital creates a Facebook page and posts healthcare information and hospital news, it is engaging in marketing (Kordzadeh, 2015). By providing information to the people connected with the hospital on Facebook, hospitals can empower patients and their families (Griffis et al., 2014). The likes on Facebook could not be entirely accurate as a measure of the actual popularity of the hospital. Many factors, such as most of the likes for a hospital coming from a set of people who live in the neighborhood, may explain the number of likes; however, this information still provides a measure one can analyze in statistics and surveys in comparison to other institutions.

Information Dissemination

The ratings on Facebook, Instagram, and other social media platforms reflect the service, performance, and patient experience of the hospital. Hospitals are also using YouTube videos to educate the patients. They use YouTube to introduce them to medical procedures, pre-operative preparation, post-operation follow-ups and to provide other information that could be informative for the patients. This information can help to reduce patients' fears and encourage them to engage in their own healthcare (Huang, 2013). It has become highly important for hospitals to discover innovative ways to keep in touch and engage with patients who are outside the hospital environment.

Social Media: Utilization by Hospitals

In this age of modern technology, people are more active and easily approachable through social media platforms than through mail and phone communications. Using social media for this purpose is both cost-effective and easy (Larsson & Ihlebaek, 2016). Using social media eliminates many barriers between physicians and patients and can allow patients to get guidance

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directly. Physicians' activities on social media can also help them in their research fields. It can help with advancing their career and with learning new things as it promotes greater interaction with other medical professionals (Bernhardt et al., 2014; Donelle & Booth, 2012). Another huge benefit is that physicians can easily have access to more descriptive, precise, and reliable information (Ventola, 2014; Chretien & Kind, 2013).

Still, even though social media usage has risen, some hospitals remain unconvinced and reluctant to use it. Even as usage has increased, only 15% of the hospitals within the Ohio Hospital Association dedicate full-time professionals to maintain their social media sites (Newswire, 2013). Some healthcare professionals in rural and suburban areas also have reservations about using social media. In particular, privacy and security concerns can be a barrier to use. Some even think that social media can cause negative publicity of a hospital through negative comments from patients (Richter et al., 2014).

Alternatively, many hospitals are succeeding in implementing social media with minimal expenditure. The targeted audience through a Facebook post, Twitter tweets, YouTube videos, and Instagram uploads is immense. This study attempts to explain the adoption and utilization of social media among hospitals in the Midwest region and to analyze whether the adoption and utilization of social media changes from hospital to hospital depending on characteristics such as profit status and bed count.

LITERATURE REVIEW

Social Media

Social networking started with people's desire to connect with their old school friends. This later evolved into social media sites that enable people to connect and share thoughts with others in the same community (Facinelli, 2009; Hackworth & Kunz, 2010). Healthcare, industry suppliers, trade organizations, area developers, franchisees, potential franchisees, and consumers are already regularly communicating through social media. This form of communication is accessible, flexible, and easy to use. Today, every brand needs to have a social media presence (Hackworth & Kunz, 2010). The way businesses communicate with customers has changed with the growth of web applications that simultaneously connect businesses with vast audiences. Social media communications also have the major advantage of allowing businesses to communicate with customers in their own personal spaces (Facinelli, 2009). Businesses can use social media to build a new application or use existing ones. Building a new application that generates viral campaigns would be possible but also difficult, as a business would need to spend resources, such as time, to do this. Alternatively, it is easy, effortless and requires no expertise to use existing applications. This also eliminates the search for an audience.

Social Media in Healthcare

The healthcare industry has struggled to understand the impact of social media on healthcare services from an organizational point of view. Clearly, usage of social networking sites to share health-related information will grow exponentially, as there is a demand from patients and consumers who want access to timely healthcare data from medical experts. This has led many hospitals to embrace social media platforms as a way to connect with patients and consumers.

(Caudullo, 2012). Progressing requires revamping and upgrading healthcare associations. These associations then have to decide whether to change their traditional frameworks to change into new associations that can combine global needs with considering local demands (Gravili, 2013). In this situation, hospitals need to create viable communication forms that encourage clinic-patient relationships, actualize and share data, react to patients' feelings, oversee vulnerability, empower decision making and encourage patients to self-manage.

Social Media Adoption Across America

Social-networking sites provide various features that enable users to fulfill individual needs. Generally, people use social networks like Facebook and Twitter to share their statuses and pictures and to engage with others. People use YouTube to watch and share videos. The social media user population has increased over the past few years drastically all over the world. In the U.S., the usage of social networking sites has increased from 8% to 72% in a nine-year period from 2005 to 2013 (George et al., 2013). People of all ages and professions use social-networking sites frequently. As of 2017, the number of Facebook users has exceeded two billion worldwide and that of Twitter users has exceeded 284 million. 3.25 billion videos have now been viewed on YouTube. Even with these high numbers, social media usage is still in its infancy. As social media adoption and utilization in hospitals is budget neutral, any organization can benefit from it (Sarringhaus, 2011). The only cost associated with it is in personnel.

Facebook

This is the most eminent social-networking site that allows people around the globe to communicate with each other in an easy yet effective way (Hackworth & Kunz, 2010). As of 2017, Facebook users have exceeded two billion worldwide. Hospitals use Facebook to connect with people who live in the same community. They post health-related information that reaches people who after viewing it can like or dislike it. Whenever a person visits a hospital facility, they can check in and post about how they feel being at that place. People can search for a hospital's home page and, if they like the page, they can start receiving news feeds and posts that they can like or share.

Twitter

This is a microblogging social media platform that enables users to post 280-character messages in so-called "tweets". This distinctive social media platform is growing every day and now exceeds 284 million users. With its rapid increase in usage, it has impacted how people interact, share experiences and make a living. Among many other ways of connecting, microblogging is a current method for directly approaching a desired person of contact. In certain situations, social media channels like Twitter can play a crucial role in getting the right data to persons in times of crisis. For example, in the instance of the H1N1 Pandemic, key words were used to disseminate information regarding sharing resources, personal experiences, opinions, humor, frustrations, concerns, misinformation, and questions. All of this provided data for the organizations working to solve the crisis and helped them to improve service.

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Instagram

Like Facebook and Twitter, Instagram has users create a profile through which they can share information. This information is in the form of photos uploaded into the users' cloud space instead of in the form of tweets or statuses. Users get news feeds through which they can share their feelings for the uploaded photos. It has been estimated that there are 500 million users around the globe, yet hospitals just began to use Instagram as a tool to attract people. Hospitals can use Instagram to increase recognition by posting content about good health practices and by advertising for wellness events (Kernan, 2021). The key for hospitals to connect with people is to be consistent with posting content (Committee on the Learning Health Care System in America, 2013).

YouTube

This is the most popular video hub that allows users to post media content on the web to be viewed by people from any part of the world. The major advantage of YouTube is that it is free, flexible, and easy to use. Hospitals can use YouTube to upload media related to policies and available services. For instance, a hospital can post videos of its admission process, through which it can reduce complications in that process. A hospital can post videos of critical cases that its physicians have solved and can suggest preventive actions (Hackworth & Kunz, 2010). People can subscribe to the YouTube channel related to the hospital to get notifications about videos that the hospital posts. These videos provide valuable information to the users and serve as good advertisements for the hospital's brand.

METHODOLOGY

Design of the Study

We have collected hospital-related social media activity on four popular social media platforms: Facebook, Twitter, YouTube, and Instagram. We reviewed the adoption and utilization of each of the social media platforms among hospitals in the Midwest region. To understand the adoption of social media by the hospital, we will analyze each hospital's existence and the number of accounts on a platform. In order to understand the utilization of social media by these hospitals, we will analyze each hospital's activity and frequency of posts as the parameter.

Population of the Study

We included hospitals in the Midwest region reporting complete data to the 2015 American Hospital Association Survey (AHAS). The study included 912 hospitals in the region. Hospital characteristics were derived from the AHAS. These include control status (public, private nonprofit, private for-profit), bed count (small: less than 99 beds; medium: 100 to 299 beds; large: 300 or more beds), and state (Illinois, Indiana, Ohio, Michigan, Wisconsin), service (the hospital's specialty), network (whether the hospital is participating in a network), physician-owned (whether the hospital physician-owned), total outpatient visits, total capital expenditure, doctors (full-time physicians and dentists), full-time registered nurses, full-time medical and

dental residents and interns and full-time licensed practical or vocational nurses. We extracted data for each hospital from the four social media platforms. Data included whether each hospital had an account (adoption) and, if so, activity on each social media account (utilization). These platforms were selected because of their widespread popularity, free public access, and availability of posted usage metrics. Webpages on Facebook, Twitter, Instagram, and YouTube are created by hospitals. Hospitals can create accounts and then post messages and pictures through these accounts to their followers.

Data Collection

To acquire information from the four social-networking platforms, we initially identified the webpage for every hospital through a web search of the hospital names from the AHAS study. We made a note of the links to the social media webpages for the hospital from information on the hospital's website. If the hospital did not have any information regarding its social media platforms on its website, we performed a direct search for the hospital's account on all four platforms. In these cases, the hospital's networking website page was verified by checking the address of the hospital on the page with the known address of the hospitals from the AHAS surveys. We determined the adoption of social media by whether the hospital had a social media account. We determined the usage of social media by the hospital by measuring data that could be recorded from each social-networking website. This data included the number of likes (Facebook), number of followers (Twitter), number of followers (Instagram), and number of subscribers (YouTube). For hospital centers with numerous accounts or pages on a single platform, we chose the page created by the hospital. To be as accurate as possible, we chose not to include the information from social media accounts that the hospital did not authorize. The social media activity was recorded for one month (Glaser, 2016).

Statistical Analysis

We recorded the percentage of hospitals having Facebook, Twitter, YouTube, and Instagram accounts to determine the adoption of social media platforms across the hospitals in the Midwest region. Due to the right-skewed distribution of utilization (likes, followers, subscribers, and Instagram followers), we reported medians and an interquartile range. For hospital characteristics like state, control, service, network, physician, and bed count ANOVA has been used to find if there is any difference in categories in using each social media platform. For instance, as there are five states in the study, we used ANOVA to find if there is any difference in social media utilization between those states. We also used a regression procedure to assess the independent associations of hospital characteristics on the magnitude of social media activity. We considered social media utilization as a dependent variable and hospital characteristics such as total outpatients visit, total capital expenditures, full-time physicians, full-time medical interns, full-time registered nurses, and licensed practical nurses as independent variables. We recorded the ones that are significantly able to determine the magnitude of social media utilization. Due to the skewed nature of utilization, we used the log transformation of social media utilization to approximate the normal distribution.

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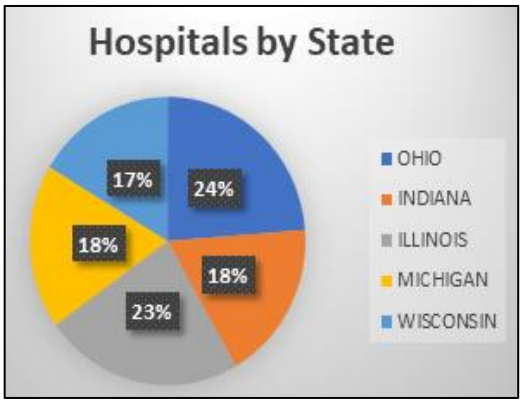
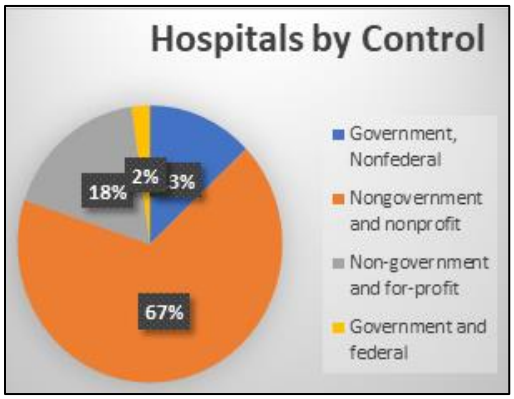
Adoption of Social Media

Social media adoption by the hospitals varied across different social media platforms with 763 (83.66%) hospitals having Facebook pages, 438(48.02%) hospitals having Twitter handles, 557(61.07%) hospitals having YouTube channels, and 183 (20.06%) hospitals having Instagram accounts. Overall, 289 (31.68%) hospitals had accounts on 3 platforms, and 104 hospitals out of 912 have accounts on all four social media platforms.

Descriptive Analysis of Social Media Adoption

The pie charts below give a pictorial understanding of the social media adoption of the hospitals in states in the Midwest region and visually depict variables such as control, service specialty, bed-count, and the number of registered nurses, licensed nurses, and full-time physicians. The first chart shows the number of hospitals in each state. Our research is on hospitals in the Midwest region and includes Ohio, Indiana, Illinois, Michigan, and Wisconsin. From the pie chart, we can observe that the number of hospitals in each state is almost equal except in Ohio and Wisconsin, where the number is comparatively high.





The pie-chart with hospital control characteristics tells us that most of the hospitals are nongovernment and nonprofit (67%). 46% (307) of the hospitals have a small bed count (less than 100 beds), 24% (162) a large bed count (more than 299 beds), and 30% (196) a medium bed count (100-299 beds). 34% (3352) of the vocational-practical nurses in the study are from Ohio. Full-time registered nurses are found more often in Ohio too, with 31%(63,200). Illinois follows with 26% (52,285). Full-time physicians and dentists are also high in Ohio with 37% (9294).

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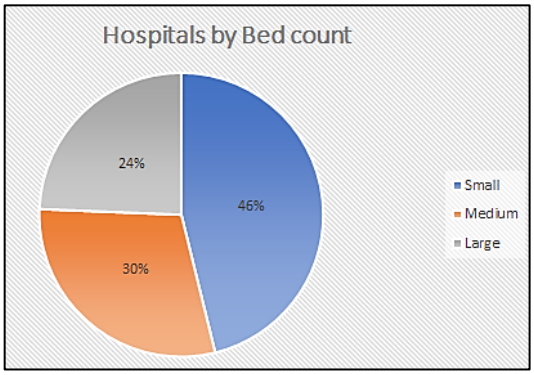

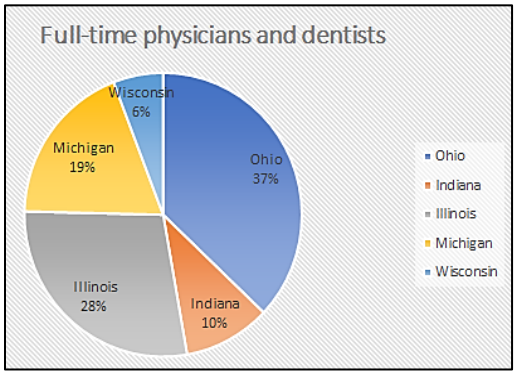

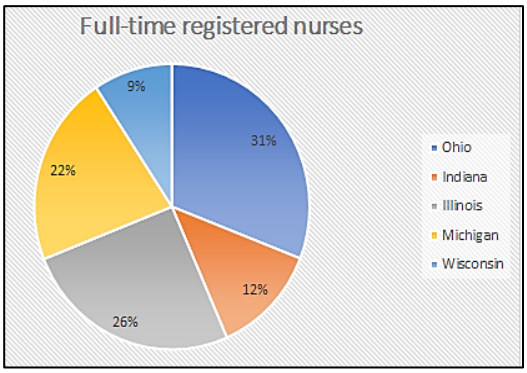

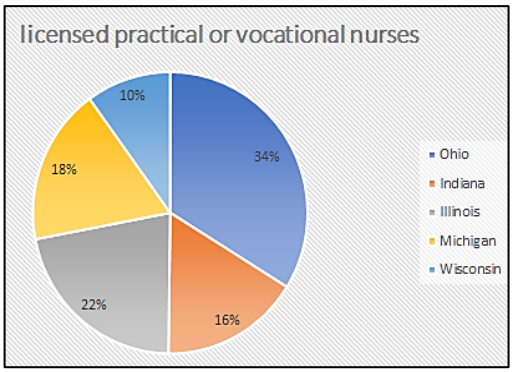

The “Hospitals by Service” pie chart provides information regarding the specialty of the hospitals. Cancer represents cancer specialty hospitals. Other various specialty hospitals include heart hospitals, children psychiatric hospitals, rehabilitation hospitals, orthopedic hospitals, and so on. General medical and surgical hospitals are high compared to other service hospitals with a whopping 700 in number. Psychiatric Hospitals follow with 77. Acute long-term care hospitals come next with 70. There are 22 rehabilitation hospitals. The rest of the hospitals are in one, two, three, or less than nine in numbers.

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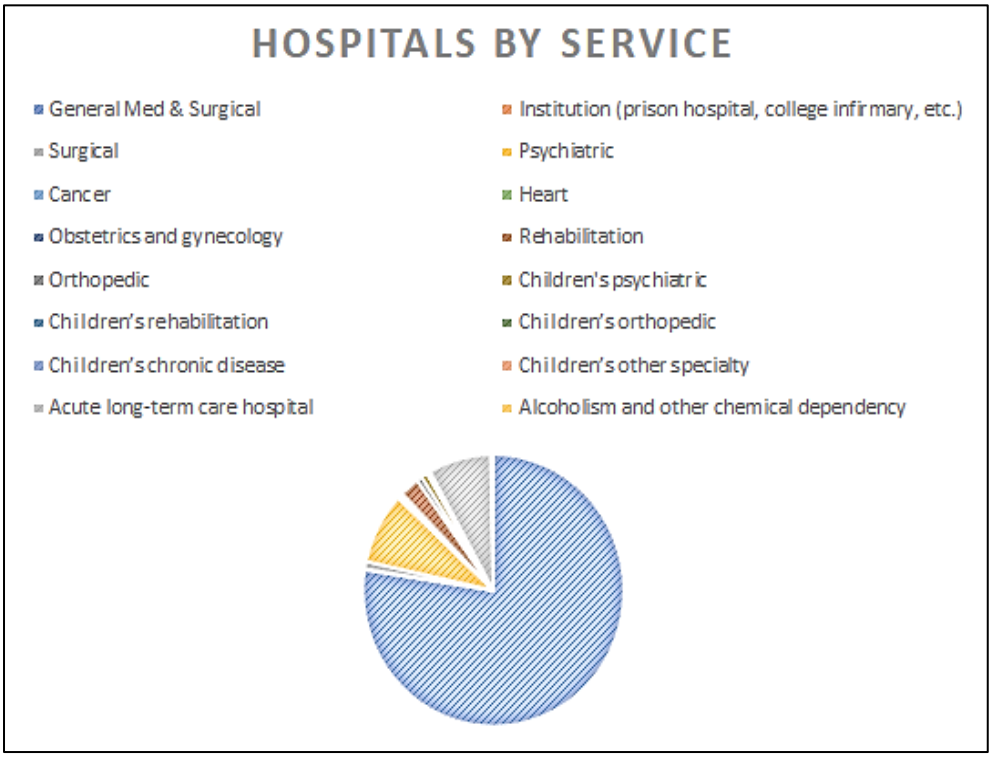
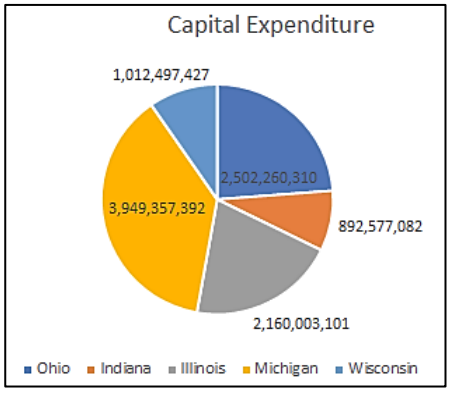
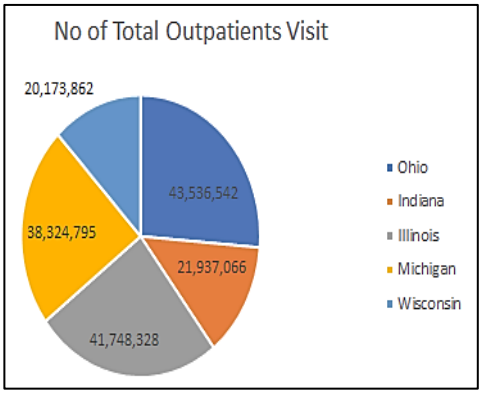


The total capital expenditure for hospitals is high in the state of Michigan with 3,949,357,392 USD. Indiana has the least capital expenditure for hospitals with 892,577,082 USD. Total outpatient visits are more for the hospitals in Ohio with a number of 43,536,542. Illinois follows with 41,748,328. Next is Michigan with 38,324,795 outpatient visits. Wisconsin had the fewest outpatient visits of all the states with 20,173,862.





A quartile distribution of social media utilization in Facebook, Twitter, YouTube, and Instagram across Midwest region hospitals is shown in the following graphs.

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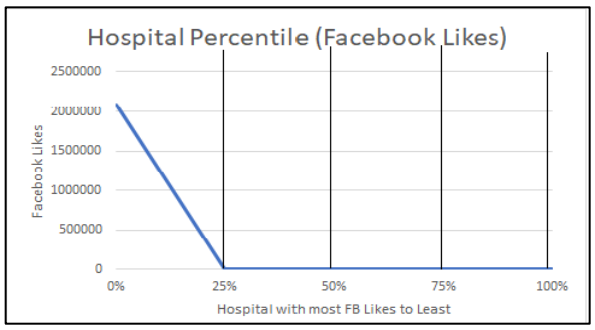

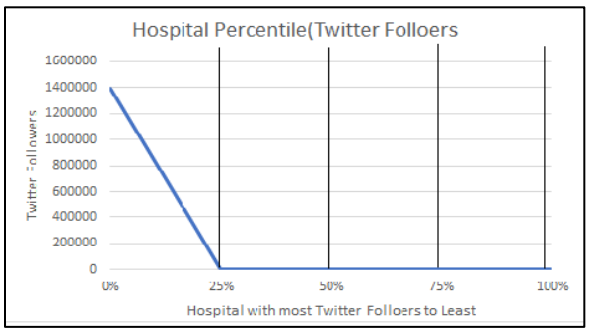

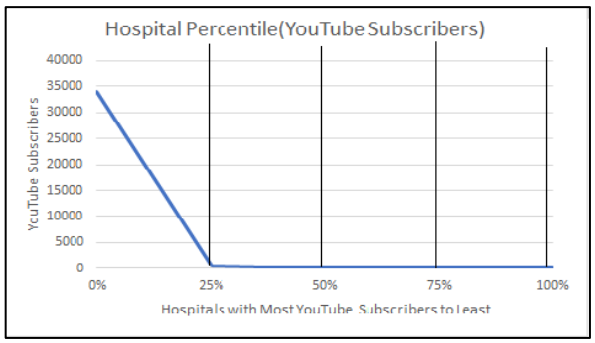

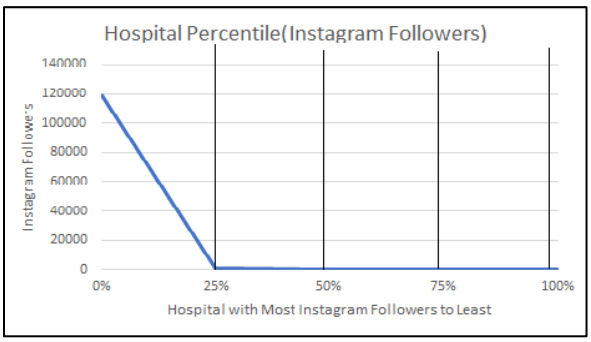

Utilization of Social Media

Appendix 1 and Appendix 2 display the magnitude of social media utilization differentiated by hospital characteristics. Hospitals in Ohio, with a larger bed count, under federal government control, that participates in a network and hospitals for specialties such as children's rehabilitation had significantly more social media utilization than their comparison groups across all four social media platforms. For example, large hospitals (>300 beds) compared to the smallest hospitals (<99 beds) had a median of 6901 (IQR 2751-17004) versus median 1311 (IQR 640-2991.5) Facebook likes, median 2567 (IQR 840-7050) versus median 613 (IQR 150-4617) Twitter followers, median 267 (IQR 72-1384) versus median 69 (IQR 7-382) YouTube subscribers, and median 431 (IQR 17-1053) versus median 87.5 (IQR 39-622) followers on Instagram. The utilization of different platforms varies among the states. For example, Facebook and Instagram usage are high by hospitals in the Ohio region, but more hospitals in Wisconsin are using YouTube than in other states. Hospitals in Illinois are ahead of other states' hospitals in using Twitter. Hospitals participating in a network compared to hospitals not participating in a network had a median of 3154 (IQR 1181-11832) versus 1766.5 (IQR 763-4641) Facebook likes, median 2496 (IQR 578-6476) versus median 829 (IQR 203-3903) Twitter followers, median 80 (IQR 10-495) versus median 234 (IQR 39-841) YouTube subscribers, median 175 (IQR 62-660) versus median 457(IQR 102-934) Instagram followers.

From Table 1 and 2, we could determine the significant characteristics in ANOVA test results for Facebook, Twitter, YouTube, and Instagram. We can see the hospital characteristics that are significant in determining the utilization of social media in hospitals. The F-value generally determines the variation between sample means. Here every character has a few sub-divisions. For example, since there are five states, the *F*-value 6.76 determines that at least one state has different utilization trends from the others. We have used ANOVA procedures to determine if

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there is any difference between states and discovered that Ohio differs significantly from other states. This shows that hospitals in Ohio have different trends of social media utilization compared to other states. Hospitals are categorized into four controls: government nonfederal, non-government and nonprofit, non-government and for-profit, and government federal. The *F*-value for control 21.44 determines that the hospitals under at least one of these controls exhibit a significant difference in Facebook utilization compared to hospitals under other controls. The LSD test for controls shows a significant difference between all controls except between government federal and government nonfederal. The LSD test for the network characteristic tells us that Facebook utilization depends on whether the hospital participates in a network. The service has many sub characteristics with a hospital's specialty, and there are at least 11 significant characteristics. We determined that the utilization of Facebook is significantly higher in general medical and surgical, surgical, psychiatric, cancer, heart, rehabilitation, children's general medical and surgical, children's rehabilitation, children's psychiatric, children's other specialty, and acute long-term care hospitals. The study did not show the physician-owned hospital characteristic to be a significant determinant of utilization as the *F*-value is 0.07. Considering the bed-count characteristic, the study showed that a large bed count correlated with higher social media use compared to small and medium bed counts.

Whereas in analyzing Twitter utilization, we can see that in all the characteristics at least one sub-division shows a significant difference in Twitter utilization compared to the others. The F-value 3.10 for the state shows that at least one state differs in Twitter utilization. From LSD, we can see that Michigan has significantly different trends of Twitter utilization compared to the other four states. In control from LSD, we can see no significant difference between Twitter utilization of hospitals under government federal - non-government non-profit, and government non-federal-nongovernment for profit. The LSD for service shows that hospitals that provide children's rehabilitation services have significantly different Twitter utilization from other services. The LSD test for the network characteristic shows that whether a hospital participates in a network determines Twitter utilization. The physician-owned hospital characteristic is significant with the utilization as the *F*-value is 4.61. This shows a significant difference in Twitter utilization by hospitals owned by physicians and those not owned by physicians. In bed count, we can see that hospitals with small i.e. (0-100beds) have comparatively different utilization trends to medium and high range hospitals.

Table 1: ANOVA Test Results on Facebook and Twitter Utilization

	Facebook likes (n= 763)		**Twitter Followers** (n = 438)	
	F-value	***p***	***F-value***	***p***
State	6.76	< 0.0001	3.10	0.0156
Control	21.44	< 0.0001	7.87	< 0.0001
Service	8.14	< 0.0001	2.99	0.0002
Network	17.31	< 0.0001	19.57	< 0.0001
Physician	0.07	0.7878	4.61	0.0326
Bed Count	25.76	< 0.0001	11.51	< 0.0001

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Whereas, in considering YouTube utilization, the ANOVA test results show that, except for state and physician variables, all other characteristics exhibit a significant difference. The LSD Test shows that hospitals under government and nonfederal control exhibit significantly different utilization trends compared to others. Hospitals that provide children's rehabilitation, and children's psychiatric services exhibit different utilization trends compared to hospitals that provide other services. The LSD test for the network characteristic shows that whether a hospital participates in a network determines YouTube utilization. The *F*-value 12.66 for bed count and the LSD Test show that hospitals with the characteristics of small, medium, and large have significantly different YouTube utilization from others. Whereas in considering Instagram, the ANOVA test table shows that only state and control correlate with a significant difference in Instagram utilization. The LSD test for the state shows that Ohio state has a different trend in Instagram utilization compared to other states. LSD for control shows that hospitals controlled by the federal government have different trends of Instagram utilization compared to hospitals under other controls.

Table 2: ANOVA Test Results on YouTube and Instagram Utilization

	YouTube Subscribers (n = 557)		**Instagram Followers** (n = 183)	
	F-value	***p***	***F-value***	***p***
State	1.81	0.1262	4.15	0.0031
Control	7.30	< 0.0001	3.81	0.0112
Service	4.58	< 0.0001	1.51	0.1175
Network	11.25	0.0009	2.74	0.1004
Physician	0.48	0.4900	1.16	0.2834
Bed Count	12.66	< 0.0001	5.24	0.0065

Tables 5 and 6 provide the information on the characteristics that determine the significance of utilization of social media. The table shows the OLS regression of social media utilization for each of the four social media platforms using hospital characteristics: total outpatients visits, total capital expenditures, full-time physicians, full-time medical interns, full-time registered nurses, and licensed practical nurses.

Table 5: OLS Regression Results on Facebook and Twitter Utilization

	Facebook likes (n = 763)		**Twitter Followers** (n = 438)	
	t-value	***p***	***t-value***	***p***
Total outpatient visits	1.36	0.1758	0.62	0.5361
Total capital expenditures	-0.46	0.6489	0.21	0.835
Full-time physicians	1.07	0.2839	-0.11	0.9114
Full-time medical interns	-2.61	0.0094	0.65	0.5149
Full-time registered nurses	5.09	< 0.0001	2.33	0.0203
Licensed practical nurses	0.64	0.5205	-1.94	0.0529

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The full-time medical interns characteristic is significant for an increased correlation in Facebook likes but is not significant with any measure on the other social media platforms. Full-time registered nurses correlate significantly with higher utilization of all four social media platforms across all the hospitals in the Midwest region. A higher number of full-time registered nurses in hospitals correlates with more Facebook likes, Twitter followers, Instagram followers, and YouTube subscribers.

Table 6: OLS Regression on YouTube and Instagram Utilization

	YouTube Subscribers (n = 557)		**Instagram Followers** (n = 183)	
	t-value	*p*	*t-value*	*p*
Total outpatient visits	-0.18	0.8546	0.24	0.8079
Total capital expenditures	-0.86	0.3931	0.17	0.8635
Full-time physicians	1.36	0.1735	0.32	0.7492
Full-time medical interns	-0.98	0.3254	-0.03	0.9773
Full-time registered nurses	4.15	< 0.0001	2.17	0.0322
Licensed practical nurses	1.73	0.0852	-0.86	0.3935

DISCUSSION

For this study, we researched social media adoption by hospitals in the Midwest region. We have collected the number of hospitals that have accounts on four social media platforms: Facebook, Twitter, YouTube, and Instagram. We also collected information regarding utilization such as the number of likes on the hospital's Facebook page, number of followers for the hospital's Twitter handle, number of subscribers for the hospital's YouTube channel, and number of followers for the hospital's Instagram account. These two sets of data allow us to analyze the adoption and utilization of social media by hospitals. We define adoption by checking whether the hospital has an account on any of the social media platforms. The adoption of social media varied across platforms, with 763 (83.66%) having a Facebook, 438(48.02%) having a Twitter, 557 (61.07%) having a YouTube, and 183 (20.06%) having an Instagram account. Overall, 289 (31.68%) hospitals had accounts on three platforms. 104(11.4%) hospitals out of 912 have accounts on all four social media platforms. The number of hospitals in Ohio, Indiana, Illinois, Michigan, and Wisconsin is 217, 164, 213, 168, and 150.

We define utilization as how actively hospitals are using each social media account to connect with the people and analyzed the difference in utilization between hospitals using 12 characteristics. We collected one month of social media activity from each platform. We performed statistical analysis like ANOVA test and OLS regression analysis to discover which of the hospital characteristics significantly impacted social media utilization.

From the univariant procedure results, we can see that Ohio state has higher social media utilization with Facebook likes (Median 4416 & IQR 1386-13338), Twitter Followers (Median 1709 & IQR 489-5732), YouTube subscribers (Median 167 & IQR 27-663) and Instagram Followers (Median 629 & IQR 215-1406) compared to other states. The government federal

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hospitals have more utilization with Facebook likes (Median 4139 & IQR 2956-6430) and Instagram Followers (Median 61600 & IQR 113-61652). Government nonfederal hospitals have high utilization on YouTube (Median 1518 & IQR 685-3761). Non-government not-for-profit hospitals have more Twitter utilization (Median 1871.5 & IQR 506-6476). Children specialty hospitals have higher social media utilization than other specialty hospitals. Children's other specialty and children's general medicine & surgical hospitals have higher Facebook utilization with (Median 660013 & IQR 660013-660013) and (Median 61993.5 & IQR 45218-119089). Children's rehabilitation hospitals have a higher median in Twitter (Median 1396604 & IQR 1396604-1396604). Children's orthopedic hospitals have a higher degree of YouTube utilization (Median 29806 & IQR 29806-29806). Children's chronic disease hospitals used Instagram more than other social media platforms (Median 10686 & IQR 10686-10686). Hospitals that participate in a network have a higher rate of utilization on Facebook and Twitter (Median 3154 and 2496). Hospitals that do not participate in a network have high social media utilization on YouTube and Instagram (Median 234 and 457). Physician-owned hospitals have higher social median utilization on Facebook, YouTube, and Instagram (Medians 2338.5, 164.5, and 388). From this, we could understand that physician-owned hospitals utilize social media more than hospitals that are not physician-owned. The hospitals that are not physician-owned have a higher rate of utilization on Twitter (Median 1793). Hospitals with a large bed count have a higher rate of utilization on all social media platforms. This shows that huge hospitals are more active on social media than small and medium-sized hospitals.

The ANOVA test results help us to analyze how sub-characteristics significantly impact social media utilization. From the LSD test, we can visualize any significant differences among sub-characteristics impacting social media. After analyzing the ANOVA test and LSD test results, we found that the government-operated hospitals in Ohio with large bed-counts show comparatively higher utilization of the Facebook platform than others. This explains how the government hospitals in Ohio are good at connecting with people through Facebook. We can see that the factor of physician-owned hospitals does not significantly affect Facebook usage. For Twitter, children's rehabilitation hospitals in Michigan that are majorly owned by physicians and that have small bed counts show significantly higher utilization. From this, we can interpret that children's rehabilitation hospitals in Michigan are more active on Twitter.

For YouTube, utilization trends were similar across all the states and whether the hospital was physician-owned or not. Government nonfederal hospitals that provide children's psychiatric services exhibit higher YouTube utilization. Lastly, Instagram utilization is higher in Ohio—especially in government federal hospitals. This shows that the government federal hospitals are using Instagram at a much higher rate than other hospitals. We have used regression analysis to find which of the hospitals characteristics are impacting social media utilization. From the regression analysis results, we observed that irrespective of the social media platform, hospitals with more full-time registered nurses have more social media utilization. Also, hospitals with more full-time medical interns exhibit higher Facebook utilization.

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Limitations

This quantitative study has many drawbacks, our study is based on five states of the Midwest region: Ohio, Wisconsin, Michigan, Indiana, and Illinois. As the rate of adoption of social media across hospitals grows, it shows the importance of social media to this present generation. However, since most of the hospitals in this study are active on social media on various platforms, we cannot know exactly how social media is being utilized. In this study, we have come across many large hospitals that serve thousands of patients but are not active on social media. In such cases, we cannot calibrate the popularity of the hospital on social media on an adoption and utilization basis. We realized that private groups of hospitals actively use social media and that public and federal hospitals were not very active on social media. We also found that the provided links on many hospital homepages were not accessible and that the links redirected to other hospitals. Also, several hospitals had multiple accounts. This could cause damage to the visits to the actual social media accounts. Considering this, the utilization and adoption of social media cannot be known. We were also unable to gather urban/rural information about hospitals. This would have provided a much deeper understanding of social media adoption and utilization.

CONCLUSION

Hospitals in the Midwest region have adopted the usage of the four social media platforms (Facebook, Twitter, YouTube, and Instagram) quite well. This usage has increased and will continue increasing in the coming years. Hospitals using social media platforms to reach patients and customers are trying to create an impact through building relationships. In the past, maintaining relationships with patients once they left the hospital was unimaginable, and marketing the hospital was an expensive task. Now, with social media, maintaining this relationship is easy and inexpensive. Hospitals will likely adopt social media usage to a much greater extent in the near future. From this study, we can conclude that different states have their own trends in social media utilization and that social media platform usage depends on the user. This indirectly impacts the social media utilization of the hospital. In all the states, government-owned hospitals show a higher social media utilization rate than others. This demonstrates that people are looking out for government hospitals' accounts on social media. All children's specialty hospitals have higher social media adoption and utilization because everyone feels children's healthcare is more important. Hospitals with a higher number of full-time registered nurses are possibly the reason for a hospital's higher social media activity. From this, we can interpret that a higher number of full-time registered nurses help hospitals in building a social media presence. In this study, we have considered a number of characteristics to get an in-depth understanding of hospitals using social media platforms. Overall, we think that hospitals in the Midwest region are using social media effectively and that its use will continue to grow.

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Appendix 1: Magnitude of Facebook and Twitter Utilization

Social Media Platform	Facebook likes (n = 763)		Twitter Followers(n = 438)	
	Median	IQR	Median	IQR
State				
Ohio	4416	1386-13338	1709	489-5732
Indiana	2337	767-6769	1135	382-6091
Illinois	1503.5	712-4102	1974	453-5834
Michigan	1533	569-4286	1136	206-1800
Wisconsin	1538	636.5-5401.5	1211	360-4652
Control				
Government, Nonfederal	1518	685-3761	700	142-1800
Non-Govt, not-for-profit	2502	1001.5-9707	1871.5	506-6476
Non-Govt, for-profit	701	189-3590	1135	131-3046
Government, federal	4139	2956-6430	1117.5	487.5-32835.5
Service				
General med & surgical	2188.5	965-6524.5	1558.5	374-5801
Surgical	419	129-727	1443	33-2853
Psychiatric	531.5	120-1518	700	13-1562
Cancer	12226.5	5525-18928	11942.5	3185-20700
Heart	13421.5	11832-15011	4363.5	2250-6477
Rehabilitation	286	117.5-6940.5	2742	1358.5-5911
Orthopedic	899	718-1350	67	61-3879
Children’s gen med & sur	61993.5	45218-119089	19257	12649-25208
Children's psychiatric	346	344-461	5256.5	50-10463
long-term care hospital	712	180-4843	1135	1135-5248
Alcoholism dependency	2012	1844-2166	170	75-265
Network				
Yes	3154	1181-11832	2496	578-6476
No	1766.5	763-4641	829	203-3903
Physician				
Yes	2338.5	1072.5-4961.5	774	121-4652
No	2188.5	874.5-7798.5	1793	432.5-5962
Bedcount				
Small (0-100 beds)	1311	640-2991.5	613	150-4617
Medium (101-300 beds)	2843	1349-6200	1827	543-6477
Large(301 or more beds)	6901	2751-17004	2567	840-7050

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Appendix 2: Magnitude of YouTube and Instagram Utilization

Social Media Platform	YouTube likes (n = 557)		Instagram Followers (n =183)	
	Median	IQR	Median	IQR
State				
Ohio	167	27-663	629	215-1406
Indiana	170.5	24-843	332.5	27.5-663
Illinois	71	17-349	405	71-863
Michigan	97	3-387	259.5	64-566
Wisconsin	202	45-873	82	39-429
Control				
Government, Nonfederal	1518	685-3761	158.5	37.5-552.5
Non-Govt, not-for-profit	165	24-789	370	75-795
Non-Govt, for-profit	167	15-276	390	30-572
Government, federal	0	0-347	61600	113-61652
Service				
Generalmed & surgical	98	18-513	322	64-725
Surgical	5	0-342	64	64-64
Psychiatric	10	0-196	81	25-166
Cancer	558	234-9836	566	566-566
Heart	362.5	0-725		
Rehabilitation	795	469-1329		
Orthopedic	554	151-976	505	9-1001
Children’s gen med & sur	257	174-7985	9012.5	7625-10400
Children's psychiatric	5777.5	2832-9276.5	118	118-118
Children’s rehabilitation	9.5	4-17.5	1042	1042-1042
Children’s other specialty	80	80-80	390	0-390
Alcoholism dependency	167	167-406		
Network				
Yes	80	10-495	175	62-660
No	234	39-841	457	102-934
Physician				
Yes	164.5	18-663	388	78-800
No	66	12-333	106.5	62-622
Bedcount				
Small (0-100 beds)	69	7-382	87.5	39-622
Medium (101-300 beds)	121	15-77	405	120-754
Large (301 or more beds)	267	72-1384	431	17-1053

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