TWITTER AS INFORMATION SOURCE IN POPULAR SCIENCE: LIVE TWEETED SURGERIES

Mariana Carvalho

Abstract

This paper analyzes Twitter as an information source for popular science and science communication, spreading information to professionals and students of the area and lay people, patients and their families. For such, we use as theoretical framework a live tweeted surgery. Through this research, we understand that Twitter needs to be more explored, updated and corrected to be considered an information source. Still, we can see this paper as an analysis of the theme, which needs further investigation. There are still many questions that need to be answered so that hospitals and physicians can make well based decisions on using or not social media.

Keywords: Social media. Twitter. Medicine. Popular science. Science communication.

Introduction

In view of medicine teaching as we see today, so traditional and using so little of the resources that the media provides, we have teachers who could teach in a more modern and dynamic way, but who choose to do so in traditional methods, losing the opportunities that their students have contact with well-known and/or experienced professionals. Also, professionals who want to update on a specific technique or the style of a specific physician could use the social media to exchange information. That peer to peer communication is what we know as science communication, and it can be formal (through books, journals, papers, interviews, lectures…, or informal, an email, a phone call, a conversation and so many other ways, including social media use). Also, patients and their family could be learning more on diseases and conditions by meeting up online with others that are going (or went) through the same situations; lay people who are interested by a subject and that could use social media to learn, maybe identifying a problem and getting specialized help. People in general need more information on health care and using social networks, informal means of communication, would make them absorb the information in a less difficult way, many times "without noticing" they were learning something important.

Since it hasn't been used in Brazil much, the use of social networks for spreading popular science in unknown here and stops knowledge from spreading in such a modern way, something we need. And as for publishing in the area, there has not been many publications regarding social media as means of communicating popular science. Facing all that, we wish to study what is the contribution of Twitter, a social network, to science communication and popular science on medicine.

This paper's goal is to analyze Twitter as a source of science communication in medicine and health care to professionals and students and as a source of popular science for patients, their families and lay people with interest in surgery.

The interest in studying the use of social networks, that were created for leisure, and are now being used for both informal science communication and popular science spreading, came from realizing that there had been changes in its use. Initially, such medias were thought for users' fun and not science transmission. Later, however, we observed that they could be powerful tools with huge potential to be used in fields other than recreationally. Lately, they have been used in medicine for people's awareness on health, disclosure of new treatments and procedures and even more dynamic medicine classes, with interview with specialists and live broadcasted surgeries.

These last ones, with a simple and direct language due to the limited character numbers of some of the tools – such as Twitter, that only admits 140 characters on each tweet – and the targeted audience. Contracted or abbreviated words can be used and a simple and clear language so that lay people and med students can understand, but also with technical language so it will be interesting for the peers,

who are other health care professionals. Besides, these tools allow spectators/users to ask questions and have them answered right away, no matter how simple or complex they are, and also allows the audience to give the hospital and/or physicians their feedback immediately.

This paper methodology is based on literature research in both national (Brazilian) and international databases and in the analysis of a surgery tweeted by Sunnybrook Hospital. This paper means to explain what is popular science, what are live tweeted surgeries, their target audience, the interests for hospitals and physicians to tweet a surgery and some of the benefits and risks. This way, hospitals, physicians and professionals that are interested can be informed on the topics mentioned above and decide if they want or not to extend their own research on the topic, begin the use of social medias for work, and maybe even tweet their own surgeries.

We also hope it will increase trustworthy information on medicine for lay people, allowing them to be more informed about health conditions that they themselves, family members or friends are being or may be affected, or just to inform to those who have interests in the matter.

Social media and popular science

According to Calder (1975 in ORRICO, 2008, online, our translation) If "[...] the science man cannot explain what he does in an understandable language outside his specialty, he ignores what he does." But for Orrico (2008, online), popular science is more than that. She states that its concept goes beyond the "[...] transposition of technical language to the common, but [it is] all and any strategy that makes it possible for the common man to have access to some kind of knowledge." She also quotes Albagli, that says:

> It appears, also, that both the electronic media and the press have great potential for spreading of popular science non-intentionally (for instance, TV series, commercials, newspaper health columns etc).

> (ALGABLI, 1998 in ORRICO, 2008, online, our translation)

We can see, then, that social media and popular science are related. Orrico (2010, p. 251, our translation) states that "[...] we have the internet as a space in which, virtually, free men and women can meet, if not to make decisions, at least to exchange information of any sort." We see an example of it in Hampton's article (2012, p. 1679), when Mike Evans, a physician, talks about his project:

> "Patient education [...] has been very generic, pretty boring, and not compelling or emotional, [...]. Our lab [in St. Michael's Hospital, in Toronto] seeks to rethink how we engage patients, to innovate, and to test out what works and what doesn't."

This way, the patients learn and apprehend trustworthy information without necessarily meaning to, maybe through specific support groups of a condition or disease, maybe just through sharing videos, comics and verbal or virtual texts. "The trick was to develop engaging media that the patients themselves and the media wanted to distribute [Evans said]." (HAMPTON, 2012, p. 1680) After a while, "[...] the experience transmitted through the media introduces distant events in everyday conscience, maybe infiltrating in daily activities of the readers/listeners/spectators of the articles." (ORRICO, 2008, online, our translation) Future professionals can even be inspired to chase a career through the introduction of some facts, unknown before, in their daily lives.

Internet communication, information and health

According to Bennet et al. (2004), in a research by the American Medical Association (AMA), the number of physicians that used internet to seek information regarding their fields was up from 20% in 1997, to 78% in 2001. According to Tenopir (2003 in CENDÓN;

SOUZA, RIBEIRO, 2011), in 2001 two thirds of the journals were available both in electronic and printed versions, and Rowland (2007 in CENDÓN; SOUZA; RIBEIRO, 2011) stated that the journals that exist in both versions have eight times more demand in its electronic version.

Such facts are not just plain coincidence. Such high specialization, high costs, how long it takes to be accepted and published, its limited size and the lack of space to store them in libraries, all those reasons and more, contributed for a crisis in publishing that was controlled thanks to the popularization of electronic journals (CENDÓN; SOUZA; RIBEIRO, 2011). Also, how structural changes in an article happened simultaneously to the changes in society's communication (MEADOWS, 1998), the ease in acquiring computers, the improvement and fall in prices, besides the popularization of the internet as a research tool, popularization of cell phones, mobile internet and e-books, all that contributed to connecting people in their searches, making journals way more accessed. And that is not limited to health care professionals, but also to patients. Thackeray, Crookston and West (2013) affirmed people with health insurance, chronic diseases and youngsters are those more inclined to use social network websites and comments forums for activities related to health care.

Fox and Rainie ([20--] in MELAMUD et al., 2007) state that health is such a researched topic between American people winning even from sports results and stock market. They use the internet for searches related to health in such a way that it is common to find, just as we open some health specific

websites, a pop-up window with the option to state if we are health care professionals or patients. The main difference, though, is the quality of the research. Usually, patients are not as well instructed as professionals on how to do the search. It is normal for them to access untrustworthy websites, to accept any information as true and even to believe that such information can substitute a medical appointment. There are some websites where the user can have a kind of online consult, paying or not, even sending them test results. But the question remains: are those real, qualified doctors?

According to Yamout et al. (2011) doctors can and must exchange information and experiences for the benefit of the patients themselves, but state that physicians in many levels of training and specialization can feel overloaded faced with so much information available. It is understandable, then, that some professionals feel reluctant to add this extra cargo in their already busy schedule.

Melamud et al. (2007) did a research about the use of internet by pediatricians and patient's parents. From 501 questionnaires applied to the parents, all were answered. 46% affirmed that they searched the internet to seek information about health, but only 15% told the pediatricians. Only 5% said they received orientation from the physician about where and how to do the search and 86% considered it important that the pediatrician recommended trustworthy websites to help the research. Table 1 indicates the kinds of information health related researched by the parents:

Table 1 – Kinds of informations health related researched by the parents of patients

Information on diseases	29,8%
Medical tratment	17,7%
Possible diagnosis	17%
Alternative medical treatments	16%
Diseases prognosis	9,6%
Institutions or professionals that treat patients with pathologies	7,4%
Self-help groups	2,5%

Source: adapted from MELAMUD et al., 2007

All that means that the families don't want nor need to sit down arms crossed waiting anxiously for the next appointment. They want

to research, to get informed. And, as we saw through the results, if they do not get any help on how to do it, they will do it on their own. If

they had the appropriate guidance, these searches would be even more well succeed, not to mention in how the wrong information can put at risk the life of the patient. By not instructing the patients' parents on the right way to research, physicians "[...] are not taking advantage of their role as educators." (MELAMUD et al., 2007, p. 516, our translation)

The use of internet can vary according to social, economics and country regulation characteristics; however, "[…] all countries should adopt the forms of communication developed in the leading science countries." (MEADOWS, 1998, p. 49)

The use of digital tools on medicine

E-patients, patients that use social media to know more about their conditions (FUTURE…, 2011) are already a big part os

world population, using not only search tools, but also social media to find what they need, in webpages of a specific disease, support groups or the profile of a health institution. Melamud et al. (2007) express how they are already intimately connected to the internet when it comes to their health. So, nothing more fair and logic that physicians and health organizations also become a part of it.

On Twitter and Facebook, hospitals post in their profiles announcements of campaigns, events (Image 1), news, health tips and warnings, advertising the hospital and showing the public a positive side. Besides, many activate hospital related keyword search, not only to keep a certain control of what is being published even if their username isn't tagged, but to answer questions, hear opinions and offer counseling (Image 2), for instance.

Image 1 – Memorial Hermann Hospital's tweet with image of doctors treating participants of a charity run

Source: Memorial Hermann (memorialhermann) on Twitter, 2014

www.jitbm.com

Image 2 – Tweet sent by a Twitter user from Sunnybrook Hospital's emergency room, just before one's father's death, and, below, the answer form the hospital, offering help
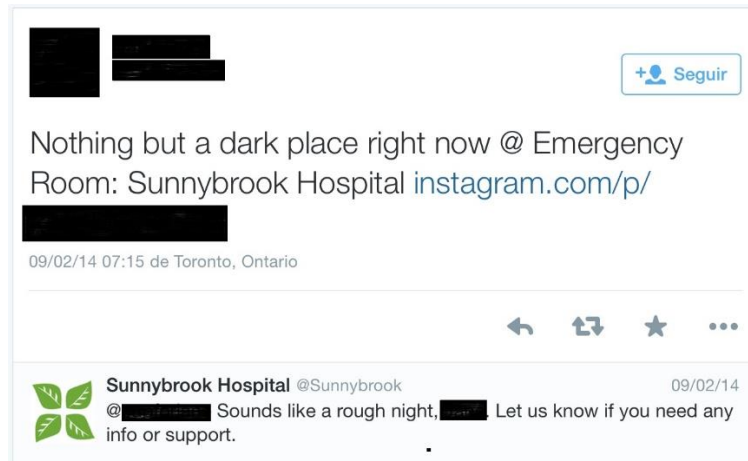
Source: Sunnybrook Hospital (sunnybrook) on Twitter, 2014

Physicians, however, have three main reasons for refusing to use social media: doubts about its benefits, little free time available and medicolegal concerns. (YAMOUT et al., 2011) The medicolegal concerns, we will talk more about them, even though this subject hasn't been discussed much until now.

Coffield et al. (2010), Yamout et al. (2011) and the journal Future Practice (2011) quote in their articles many examples as to medicolegal complications that could come up for a physician using social media, and we quote some of them:

1. Someone could post something that indicated that a physician, for instance, ingested alcoholic beverages while on call, and a co-worker could see it and warn the hospital;

2. They quote a case of a doctor that, in 2008, created a blog under a fake name where he posted details of a law suit in which he was the defendant. During trial, he was caught and that damaged him seriously (MY INTERVIEW…, 2008 in COFFIELD et al., 2010);

3. Since everything that is posted remains registered, a post could be used as evidence in a law suit of prejudice, sexual harassment, defamation etc;

4. When a doctor-patient relationship stablished via social media (be it amongst neighbors, friends, co-workers…) is suddenly interrupted, even it were only a few advices or some questions answered, the professional is under risk of suffering a law suit for medical neglect;

5. A person can be acting out as a physician without being licensed to do so.

Besides, there is also the problem of professionalism and privacy, that can be a challenge for those who use social media. Professionalism doesn't always stand, specially for those with a lack of common sense. The privacy issue isn't just about protecting the professional and the patient and not revealing confidential information. Doctors should also be aware so that they do not find out details about a patient's life that said patient didn't intend to reveal. (FUTURE…, 2011)

Nonetheless, it is important for professionals and health care organizations to be "[…] need to have a social media presence, […] to stimulate thoughtful discussion surrounding health care issues and to encourage more active involvement of patients in their own health and the health of others." (FUTURE…, 2011, p. 30) And even physicians who chose not to use social media should use them regularly, always being informed of what is being posted about them, to be aware in case something bad and/or slanderous has been posted (FUTURE…, 2011; YAMOUT et al., 2011).

Dr. Dosani, resident physician that wrote a small article for Future Practice journal (2011, p. 29), for instance, states to like being in contact with multidisciplinary knowledge of colleagues. "While the Internet has made

information available to the masses, social media have facilitated connections between individuals who consume this information, globally." Besides him, Dr. Otte, also an author from Future Practice (2011) and a blogger, states that sharing situations occurred in a bad day at work can make them funny or interesting when published in her blog.

Another positive standpoint favorable to social media is the help it offers in relation with information explosion. Health care professionals never needed to keep up with so much information, in so many formats, media and distinct websites. Social media help them by showing what their peers already selected and indicated, by sharing, publishing, signaling… in their social networks, sparing their research time. (YAMOUT et al., 2011)

Another interesting standpoint is the capacity of transferring some kind of ability through the network, and not only knowledge. An experiment in Norway, for instance, allowed doctors in remote towns to receive medical advices from a specialist via social networks to treat a patient. (COEIRA, 1995 in MEADOWS, 1998)

Live tweeted surgeries

In Brazil, few are the people who have heard of live tweeted surgeries, since no hospital in the entire country have done it so far. First done in the United States, the live tweeted surgeries are a success, and there are cases registered in Canada and Europe. With a signed permission of the patient and the hospital, an extra doctor or information technology professional stays in the operating room (OR) with a computer tweeting the whole procedure step by step, including photos and videos, all live through the hospital's Twitter account. Users who are "watching" have the chance to talk to specialists, ask questions, learn new techniques and give their feedback simultaneously. When it comes to communication amongst peers, science communication, or popular science, it is a new, modern, dynamic and curious method.

The practice initiated in 2008 when a patient tweeted his own varicose vein laser surgery (COFFIELD et al., 2010). Small surgeries were tweeted occasionally by their surgeons later on, until 2013, when the first brain surgery was tweeted live by Memorial Hermann Hospital, in Texas. After that, many hospitals have tweeted many kinds of surgeries all over the world.

According to a lecture presented by Dr. Tourian (FUTURE…, 2011), clinical narratives can promote reflection and relationship between physician and patient. More than that, tweeted surgeries can help with what Wang (2012) calls "back-translation", which simplifying the explanations to lay people. Wang states that if the back-translation is not executed correctly, it can cause gaps in the communication with the patient. Some doctors believe that using one single and simplified language could dissolve these gaps and ease the doctor-patient communication, avoiding ambiguities. Most, however, believe this change would be uncharacterizing to the profession, and prefer that things remain as they are.

As the use of traditional language influences on low synthesis powers of the new doctors, abstracts with a limited number of words, like tweets, with its limited characters, force said doctors to synthetize clinical information in a clear, practical way (WANG, 2012). Thus, tweeted surgeries allow med students to be in the OR, even if not there physically, and practice their synthesis powers. For them, it can be an exercise; a new way of studying.

The main reasons for a surgeon to agree on live tweet a surgery are patients' and their family's education, unmystifying something that is, otherwise, scary, keeping the family informed on how the procedure occurs, and education to med students and other physicians. Also, it is a good marketing strategy for both the hospital and the physician.

Since the surgery is published through an informal social network with patients, their relatives, lay people in general and health care students, the language used has to be colloquial most the time so they can keep up. The doctors use a plain language, explaining in the moments that they believe it to be necessary, and writing in a practical way so that the most number of words can fit in the 140 characters space of each tweet. However, as far as they can, they also use a more technical language, so that the tweeted surgery is not tiresome for those who work with it. Also, they create an unique hashtag to identify the surgery – although it is not necessarily a unique hashtag for each one –, a

short hashtag so that it does not use too many of the 140 characters.

The surgeries are announced with a certain amount of antecedence – some more, others less –, so that people of all over the world can watch them. And even though there are not that many people who appreciate the value of this new practice, in a short while they will be more and more used in universities' classrooms, as a sort of field research, debate or homework. Meadows (1998) does not talk specifically about tweeted surgeries, but he states that the immediate feedback and the adapted information to the recipient are among the many virtues of discussions with colleagues, which transform them in such powerful information channels; such discussions can be found in tweeted surgeries.

Besides having their questions answered immediately, for an user can post a question and is soon answered by the person in charge of tweeting, the hospital still gets the users' feedback right away. Meadows (1998, p. 134-135) also states "[…] the value of feedback becomes increasingly evident as contact becomes more informal." Again, he wasn't talking about Twitter, but we can use the quote in our context, after all, Twitter allows such interaction.

Although the information retrieval in Twitter is complicated and flawed (too many identical hashtags talking about different subjects, the research bar only searching for tweets posted less than ten days ago), many websites related to the most varied fields of knowledge (medicine, education, news, entertainment, marketing, technology, legal etc) are publishing about it, including links to access the surgeries or even the complete surgeries themselves. Sunnybrook Hospital and Memorial Hermann Hospital, for instance, kept the tweeted surgeries in their websites, making information retrieval easier for the users.

Sunnybrook Hospital live tweeted surgery

Located in Toronto, Canada, Sunnybrook Hospital tweeted its first surgery on February 20th 2014, Canada's first live tweeted surgery and nothing less than a high risk one. The heart bypass surgery was performed by Dr. Cohen and lasted about five hours. It happened to celebrate the "Heart Month", when campaigns were made to promote hearth health and awareness of heart problems. We decided to use the complete surgery available in the hospital's own website (HEART…, 2014), since it was a complete record. We divided the tweets of the surgery into seven categories based on the paper by McKendrick, Cumming and Lee (2012), as shown in Table 2:

Table 2 – Classification of the tweets into seven categories, from Tweet 1 (T_1) to Tweet 47 (T_{47})

Category	Tweets	Total Tweets, n=47
Surgery invitation/announcement	T_1, T_2, T_3, T_{19}	4
Hospital propaganda	T_{43}	1
Casual comment	T_{23}, T_{24}, T_{25}, T_{43}, T_{45}, T_{46}, T_{47}	7
Reason to be live tweeting that surgery	T_1, T_5	2
Describing the surgery	T_4, T_5, T_6, T_7, T_{11}, T_{12}, T_{13}, T_{15}, T_{16}, T_{17}, T_{19}, T_{20}, T_{21}, T_{22}, T_{25}, T_{26}, T_{27}, T_{29}, T_{30}, T_{31}, T_{35}, T_{36}, T_{37}, T_{39}, T_{40}, T_{41}, T_{46}	27
Explanation	T_3, T_8, T_9, T_{10}, T_{14}, T_{16}, T_{17}, T_{19}, T_{21}, T_{23}, T_{26}, T_{27}, T_{28}, T_{29}, T_{30}, T_{31}, T_{32}, T_{33}, T_{34}, T_{35}, T_{38}, T_{39}, T_{41}	23
Acknowledgement	T_{42}, T_{44}	2

Source: HEART…, 2014

The chosen categories are: tweets that invite or announce the surgery to be tweeted; tweets that promote the hospital; casual comments, done so that the user/spectator feels closer to the hospital, the patient and/or the medical staff; tweets that explain the motivation for this specific surgery to be tweeted and, thus, promoting the campaign cardiac health awareness; tweets that describe the surgery, narrating it; tweets that explain some procedure or something necessary so that the description is

www.jitbm.com

understood properly; acknowledgement to those who were following the surgery.

47 tweets were analyzed, but each tweet can fit in more than one category. Of these, 27 talk about the description of the surgery and 23 include some explanation, focusing on lay people or med students, for the explanations were done in a simple vocabulary and, many times, non-technical. Many of those explanations were made in sequence (many explanation tweets between description tweets). The fact that there was only one tweet promoting the hospital was important, for it showed they were interested in getting the public's attention in a less direct and obvious way. Even that one tweet was not so straightforward, since at the same it promoted its installations, it also explains to the curious public what the hospital's cardiac wing is like.

Maybe in some moments explanations have been provided just so there isn't a too long gap between one description tweet and another, in a way spectators do not give up on waiting for the updates. We made a list of tweets that used simplified language or had explanations of the tweets that included some technic words. In many cases, both languages were found in the same tweet, meaning a technical term was used and clarified right away.

Table 3 – Selection of tweets containing technical terms or colloquial language and/or explanations of technical terms

Technical language	T_6, T_7, T_9, T_{13}, T_{16}, T_{17}, T_{18}, T_{20}, T_{21}, T_{22}, T_{23}, T_{24}, T_{25}, T_{28}, T_{29}, T_{30}, T_{33}, T_{34}, T_{35}, T_{36}, T_{37}
Colloquial language	T_6, T_7, T_9, T_{16}, T_{17}, T_{18}, T_{20}, T_{21}, T_{22}, T_{23}, T_{24}, T_{25}, T_{28}, T_{29}, T_{30}, T_{33}, T_{34}, T_{35}, T_{36}, T_{37}

Source: HEART..., 2014

We also decided to categorize photos (Table 4) and videos (Table 5) of the surgery, these last ones uploaded to YouTube. We created using the same categories of Table 2.

Table 4 – Classification of the tweeted photos into seven categories, from Photo 1 (P_1) to Photo 20 (P_{20})

Category	Photos	Total, n=20
Surgery invitation/announcement	P_1, P_2	2
Hospital propaganda	0	0
Casual comment	P_3, P_8, P_{18}, P_{19}, P_{20}	5
Reason to be live tweeting that surgery	0	0
Describing the surgery	P_6, P_7, P_9, P_{10}, P_{11}, P_{12}, P_{13}, P_{14}, P_{16}, P_{17}, P_{19}	11
Explanation	P_2, P_4, P_5, P_{15}	4
Acknowledgement	0	0

Source: HEART…, 2014

Of the 20 photos published along the surgery, eleven illustrate a description of the surgery, four illustrate explanations, five some comment that will bring the user closer to the surgery (like photos of the staff or the patient, for instance) and two announce and invite people to watch the surgery. None of the photos fit in the other three categories, so those remain with a zero.

Table 5 – Classification of the tweeted videos into seven categories, from Video 1 (V_1) to Video 7 (V_7)

Category	Videos	Total, n=7
Surgery invitation/announcement	V_1	1
Hospital propaganda	0	0

Casual comment	0	0
Reason to be live tweeting that surgery	0	0
Describing the surgery	V_3, V_4	2
Explanation	V_2, V_5, V_6, V_7	4
Acknowledgement	0	0

Source: HEART…, 2014

The first video illustrated the announcement of the surgery, being a vdeo about the physician who would perform the surgery on the 20th, two videos illustrated the surgery and four some explanation. The rest of the categories did not have any videos, so they receive zero.

Besides that, it is worth mentioning that all the tweets have the hashtag #SBheart (meaning Sunnybrook heart), so that users can easily retrieve or spread the tweets and the news of the surgery.

Contibutions of this paper

This paper intended to analyze the use of social media as information sources on popular science in medicine and other health areas, focusing, more precisely, on Twitter. We did an extensive research on the literature, searching for papers related to the theme in both national (Brazilian) and international databases and in bibliography of other read articles. We observed that the opinion on using social networks to seek health information is positive, although patients prefer to use it then physicians.

We also observed that the Twitter was just discovered, a few years ago, to have another use that not just plain recreation. It is a powerful tool to spread information and help with popular science. Although it wasn't its creators' original intent, Twitter can be a powerful work, study and research tool if some problems and setbacks are solved, such as information retrieval, for instance.

For these and other reasons, the Library of Congress (LC) has been storing all tweets ever posted since Twitter's launching in 2006. According to sources such as CNN (GROSS, 2013), Time (LUCKERSON, 2013) and Daily Mail Online (NYE, 2013), in April 2010 the LC signed a deal with Twitter that authorized the storage of all public tweets, just as its videos, photos and location data and metadata in general that said tweets may have. The LC hasn't yet said how the search among all those tweets will be done, but points out that they will be available until six months after their posting.

When doing this research we realized that the Twitter cannot yet be considered as an information source tool. For such, many changes would have to occur. A future paper could explore legal, technical and structural areas and its importance for popular science, subjects that have been so little analyzed so far.

References

1. BENNET, N. L. et al. Physicians' Internet Information-Seeking Behaviors. **The Journal of Continuing Education in the Health Profession**, [S.l.], Vol. 24, p. 31-38, 2004. Disponível em: <http://onlinelibrary.wiley.com/store/10.1002/chp.1340240106/asset/1340240106_ftp.pdf;jsessionid=CCDE41A7A3C023CE780BCB705D089E46.f03t04?v=1&t=hu0ah6ox&s=12d393cbd1d8d225f89adbd6f925b3b82617ddf3>. Acesso em: 14 abr. 2014.

2. CENDÓN, B. V.; SOUZA, J. L. de A.; RIBEIRO, N. A. Satisfação dos usuários do Portal de Periódicos da Capes: um estudo sobre a obtenção de sucesso no uso do sistema. **Perspectiva em Ciência da Informação**, Belo Horizonte, v. 16, n. 2, p. 67-100, jun./ago. 2011.

3. COFFIELD, R. L. et al. Risky businness: Tweeting the symptoms of social media. **AHLA Connections,** [S.l.], Mar. 2010. Disponível em: <http://www.changehealthcare.com/downloads/press/2010.03%20AHLA%20Tweeting%20Coffield.pdf>. Acesso em: 10 jun. 2013.

4. FACEBOOK. Disponível em: < https://www.facebook.com/FacebookBrasil/info/?tab=page_info>. Acesso em: 31 dez. 2015.

5. FUTURE PRACTICE, Ottawa: CMA, Nov. 2011. Disponível em: <http://viewer.zmags.com/publication/71a919a6#/71a919a6/26>. Acesso em: 24 mar. 2016.

6. GROSS, D. Library of Congress Digs Into 170 Billion Tweets. **CNN**, [S.l.], 7 Jan. 2013. Disponível em: < http://edition.cnn.com/2013/01/07/tech/social-media/library-congress-twitter>. Acesso em: 7 jun. 2013.

7. HAMPTON, T. Media Labs Uses Videos, Comics and Others to Help People Understand About Health Issues. **JAMA**, [S.l.], Vol. 307, N. 16, p. 1679-1680, Apr. 2012. Disponível em: <http://jama.jamanetwork.com.libproxy.boisestate.edu/data/Journals/JAMA/23307/jmn0425_1679_1680.pdf>. Acesso em: 6 jun. 2013.

8. HEART SURGERY LIVE ON TWITTER: SUNNYBROOK HOSPITAL. Disponível em: < http://sunnybrook.ca/content/?page=heart-surgery-live-twitter>. Acesso em: 1 de maio 214.

9. LUCKERSON, V. What the Library of Congress Plans to Do With All Your Tweets. **Time**, California, 23 Feb. 2013. Disponível em: < http://business.time.com/2013/02/25/what-the-library-of-congress-plans-to-do-with-all-your-tweets/>. Acesso em: 8 jun. 2013.

10. MCKENDRICk, D. R. A. et al. Increased Use of Twitter at a Medical Conference: A Report and a Review of the Educational Opportunities. **J Med Internet Res.**, [S.l.], Vol. 14, N. 6, Nov./Dec. 2012. Disponível em: < http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3799570/>. Acesso em: 25 abr. 2014.

11. MEADOWS, A. J. **Communicating Research.** Bingley: Emerald, 1998. 266 p. (Library and Information Science).

12. MELAMUD, A. et al. Información sobre salud en Internet: su empleo por pediatras y padres de pacientes. **Arch. Argent. Pediatr.** [S.l.], vol. 105, n. 6, p. 513-516, 2007. Disponível em: <http://www.scielo.org.ar/cgi-bin/wxis.exe/iah/. Acesso em: 30 maio 2013.

13. MEMORIAL HERMANN (MEMORIALHERMANN) ON TWITTER. Disponível em: <http://www.twitter.com/memorialhermann>. Acesso em: 5 mar. 2014.

14. NYE, J. Library of Congress Attempts to Archive Every Tweet Sent Since 2006: All 170 Billion Of Them: Including Embarrassing and Rude Ones. **Mail Online**, London, 8 Jan. 2013. Disponível em: <http://www.dailymail.co.uk/news/article-2258752/Library-Congress-attempts-archive-tweet-sent-2006--170-billion--including-embarrassing-rude-ones.html>. Acesso em: 8 jun. 2013.

15. ORRICO, E. A representação da divulgação científica no início do século XIX: reflexos do paradigma científico. In: ENCONTRO NACIONAL DE PESQUISA EM CIÊNCIA DA INFORMAÇÃO, 9., São Paulo, 2007. São Paulo: USP, 2008.

16. ORRICO, E. Memória e discurso no entremeio das práticas informacionais contemporâneas. **Liinc em Revista**, Rio de Janeiro, v. 6, n. 2, p. 250-259, set. 2010.

17. SUNNYBROOK HOSPITAL (@SUNNYBROOK HOSPITAL) | TWITTER. Disponível em: <https://twitter.com/Sunnybrook>. Acesso em: 25 mar. 2016.

18. THACKERAY, R.; Crookston, B. T.; WEST, J. H. Correlates of Health-Related Social Media Use Among Adults. **J Med Internet Res.**, [S.l.], Vol. 15, N. 1, Jan. 2013. Disponível em: < http://www.ncbi.nlm.nih.gov/pmc/artic les/PMC3636287/>. Acesso em: 25 abr. 2014.

19. TWITTER HELP CENTER. Disponível em: <https://support.twitter.com/articles/16 4083-what-s-a-twitter-timeline>. Acesso em: 10 maio 2014.

20. WANG, C. J. Medical Documentation in the Electronic Era. **JAMA**, [S.l.], Vol. 308, N. 20, p. 2091-2092, Nov. 2012. Disponível em: <http://jama.jamanetwork.com.libprox y.boisestate.edu/data/Journals/JAMA/2 8295/jvp120104_2091_2092.pdf>. Acesso em: 6 jun. 2013.

21. YAMOUT, S. Z. et al. Using Social Media to Enhance Surgeon and Patient Education and Communication. **Bulletin of the American College of Surgeons**, [S.l.], Vol. 96, N. 7, p. 8-15, 2011. Disponível em: <http://www.facs.org/fellows_info/bull etin/2011/yamout0711.pdf>. Acesso em: 9 jun. 2013.