

# e-Health Technical Committee NewsLetter

## June 2019

On behalf of the e-Health Technical Committee (TC) of the IEEE Communications Society (ComSoc), we wish all our members a very instructive reading of this letter.

The contribution from this edition is coming from an IEEE IT Professional Editorial Paper <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8720138> on the topic of ‘Thick Data Analytics for Value-Based Healthcare’ from Lakehead University, Ontario, Canada.

Members of the e-Health community are invited to contact the author for further information or collaborations.

We also welcome all our members to share their research activities and field experiences through this open newsletter and to open up new opportunities for discussions and collaborations.

Editor: Dr. Nada Philip (Kingston University London, UK)

### Table of Contents

- 1) Thick Data Analytics for Value-Based Healthcare
- 2) Call for papers – Health and Well-Being 2019 Symposium, October 25-27, 2019, Thunder Bay, Ontario, Canada

---

### Thick Data Analytics for Value-Based Healthcare

**Jinan Fiaidhi and Sabah Mohammed**

Lakehead University, Ontario, Canada

{jfiaidhi, [mohammed](mailto:mohammed@lakeheadu.ca)}@lakeheadu.ca

There’s never been a more critical time in the history of healthcare industry to turn to clinical analytics for help in making this industry survive and achieve the required

improve both the cost and quality of care delivery. And now, for the first time in the history, governments like united states is shifting their funding formula to healthcare providers from fee-for-service reimbursements (as defined by the Affordable Care Act (ACA) of the March 2010) to a value-based purchasing healthcare. Many other governments and organizations are enforcing similar changes. In this direction, health providers need to measure and report on the care they’re delivering. Within the value-based purchasing there are some key metrics that go beyond volume that finance executives need to track to obtain a full picture of a health system’s cost and to make sound decisions, including the following [1]:

- **Throughput.** The time it takes to complete a process. This is subject to providing data on: What is the average wait time in the emergency department? What is the time between cases in the OR? What is the turnaround time for labs? With value-based purchasing, improved throughput will benefit the organization by reducing cost and increasing patient satisfaction.
- **Quality.** With value-based purchasing, hospitals are required to assess and report measures of quality relative to defined benchmarks. Did patients receive drugs within the appropriate time period? Were they given discharge instructions? Did the care manager schedule follow-up visits? How many falls occurred in the hospital? How many hospital-acquired infections? Hospitals not reporting quality metrics are subject to penalties. For CMS (Centers for Medicare & Medicaid Services) value-based purchasing, the penalty/incentive phase began in 2013. Hospital performance is being judged on both achievement relative to the national benchmark and improvement relative to internal prior score.
- **Readmissions.** Quality will also be assessed based on the rates of readmissions for all causes within a certain time period for specific patient populations. For example, what are the rates of heart failure, pneumonia and AMI readmissions within a 30- and 90-day period? In 2013, Medicare began enforcing penalties for 30-day readmissions. Penalties will increase in future years.
- **Mortality rates.** What are the hospital's mortality rates for pneumonia, heart failure and acute myocardial infarction (AMI) among its patient populations? Beginning in 2014, Medicare will include this measure in its value based purchasing formula. High mortality rates in pneumonia, heart failure and AMI will result in loss of incentives.
- **Patient satisfaction.** Patient satisfaction is more than just a concern and a goal, it's now tied directly to payment and value based healthcare models.
- **Cost per episode of care.** Containing costs is now more important than ever as value-based purchasing systems strive to keep treatment consistent and expenditures appropriate and predictable. Consider: what are the costs of the individual components of care? What are the costs of the episode across the continuum of care? Which clinical processes have the greatest cost variation? Reducing this variation will improve the cost structure.

Actually from all the above measures, the most important one is the one that is related to patient satisfaction as the article by the article from the New England Journal of Medicine published in 2013 [2] on patient satisfaction and the health outcomes data. In this direction healthcare organizations need to focus more than ever on patient-centered care as patient satisfaction metrics will play a bigger role in reimbursements as healthcare reform progresses. Most the healthcare organizations build their model of improving the patient experience through embracing data analytics and the power behind the big data initiative. However, the statistics shows that more than 92% of companies invested in big data analytics are still dealing with obstacles to successfully getting the hoped rewards through their big data projects, according to global research by CA Technologies [3]. Across industries, the adoption of big data analytics is way up. Spending has increased, and the vast majority of companies using big data expect return on investment. Moreover, unlike any other business, healthcare providers want a good reviews from their patients (e.g. Yelp review) but for healthcare providers such as hospitals, improving their ratings online is not as easy as restaurants might be able to do by serving customers faster or using fresher ingredients. The challenge is that hospitals usually interface with patients at very low moments in their life.

The traditional solution to understanding the patient experience is the use of a survey is that it limits context to answers. In such a

survey the questions that are provided include: “Was your nursing staff responsive and attentive to your needs?” it forces the respondent into a predetermined answer that lacks detail. By contrast, a patient who writes a review on Yelp for example may comment that the hospital staff was attentive but did a poor job of explaining their conditions or treatment options, how much longer they had to stay, or how to use the drugs they were given. In a notable article by written by Justin Gressel in 2015 [4] advocates for understanding the patient needs through transforming the care service into a patient centered care in similar way how other businesses do like Disney. However, learning a patient-centered approach from Disney requires few things like:

- Understanding the patient
- Everyone in the community of practice is a performer
- Seeking out interactions with patients
- Owning the patient
- Accountability

From all the above one can understand that traditional surveys and big data analytics have failed to capture patient experience and explain why patients do what they do. If surveys and big data brought some quantitative data, then the answer is that we will need more qualitative information that provides insights into the everyday emotional lives of patients. It goes beyond big data and surveys to explain why patients have certain preferences, the reasons they behave the way they do, why certain trends stick and so on. Ultimately, to understand patient’s actions and what drives them to accepting the health service (or not), we need to understand the “humanistic context” in which they pursue these actions. However, understanding patient experience from social media is a big challenge although important healthcare agencies like the FDA encourages the use of social media technologies to enhance communication, collaboration, and information exchange to promote public health. Understanding patient experience from social media should not be based only on general indicators that

we can get from the silos of information scrapped from popular social media blogs like PatientsLikeMe or Durgs.com. Understanding patient experience need to capture relevant and personal conversation with the caregiver including the entire provider/patient conversation history. In this direction, several social media like Twitter and Facebook provide the mechanism for conducting conversations and recording patient’s health stories and it all starts with just one reply to a message like Tweet. Popular conversations over Twitter and Facebook are easy to find and join. However what we need is an automatic detection of these conversation through representative dialogue structure like Twitter Tweet JSON Object or the Facebook JSON Structured Message. This process is an important first step toward deep understanding of patient’s conversations. Capturing these conversations will give light on patient experience using qualitative methods that uncover patient’s emotions, stories, and models of their world. It’s the sticky stuff that’s difficult to quantify and it will return an incredible depth of meanings and stories of patient experience. The conversation knowledge represent type of “Thick Data “ [5] which will provides caregivers a more complete context of any given situation. It requires a small sample of personalized data to see human-centered patterns in depth. The thick data approach relies on human learning which is in contrast to the big data approach that relies on machine learning. Thick Data reveals the social context of connections and conversations between data points while Big Data reveals insights with a particular range of quantified data points. Thick Data techniques accepts irreducible complexity, while Big Data techniques isolates variables to identify patterns. In this paper we will focus on techniques that help to extract patients insights based on Twitter conversations.

### **Capturing Twitter Health Conversations**

Today’s doctors and patients take to online platforms such as blogs, social media, and websites to convey opinions on health matters. Data can be collected and analyzed

from social media such as Twitter in real time with the ability to survey public opinion (sentiment) toward a subject. Bates and colleagues have described social media as a “perfect storm” in regard to patient-centered health care, which is a valuable source of data for the public and health organizations. Twitter is one such place, being easy to use, cheap, and accessible. Twitter is a mobile microblogging and social networking service. However, locating conversations from Twitter starts by identifying conversation clusters in what we call socio graph (similar to netnography or ethnography). Socio graphs provide a wealth of qualitative information on patient’s likes and interests, and also implicit social-circles. Unlike Facebook, the uniqueness of Twitter is in its conversational structure (see Figure 1).

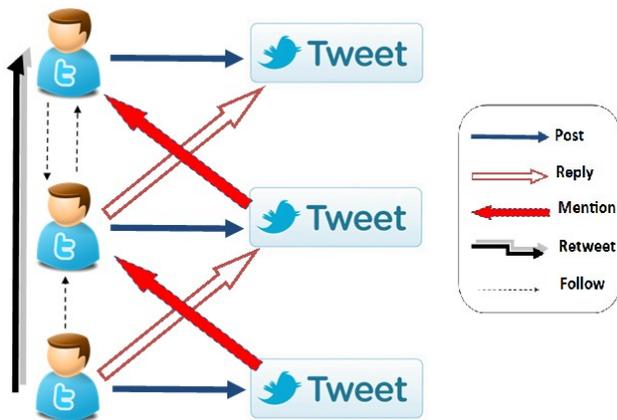


Figure 1: Twitter Conversational Structure.

On twitter patients have the option to reply to a tweet of another Twitter user, follow other patients or caregivers, and mention others in their Tweet. In this context conversation between two or more users can occur. Unfortunately the current Twitter API does not provide an easy way to retrieve conversations which let many researchers to create their own ways and methods [10]. The method that we are proposing in this article for identifying Twitter health conversations related to ADEs for given drug sets consist of three methods (see Figure 2):

(1) Conversation Clusters Localization Method: This method uses variety of social networking measures to detect and localize significant conversations related to ADEs

(2) Conversation Outcome Learning: This method take an identified conversation and learn the outcome of the conversation whether it support a possible ADE or not.

(3) Conversation Topic Modeling Method: When tweets lack annotations or category labels related to certain type of ADE, as is often the case in practice, particularly for Tweets —one must rely on unsupervised approaches that discover underlying topics directly from the raw text features in the tweets, such as using methods to identify topic modelling.

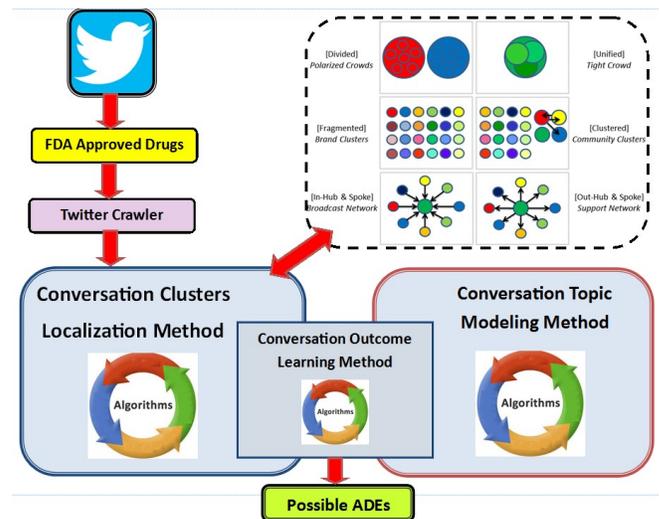


Figure 2: The Structure of our Twitter Conversation Identification System.

Our methods uses various algorithm suitable for the purpose of the designed method. For example we use link prediction to find conversation clusters while we used latent supervised algorithm for identifying conversation topics. Moreover we used context analysis for identifying the learning outcome of each conversation cluster. However, the conversation clusters localization method receive tweets from the Twitter crawler with performs basic identification of having ADEs or no ADEs as

described by figure 3.

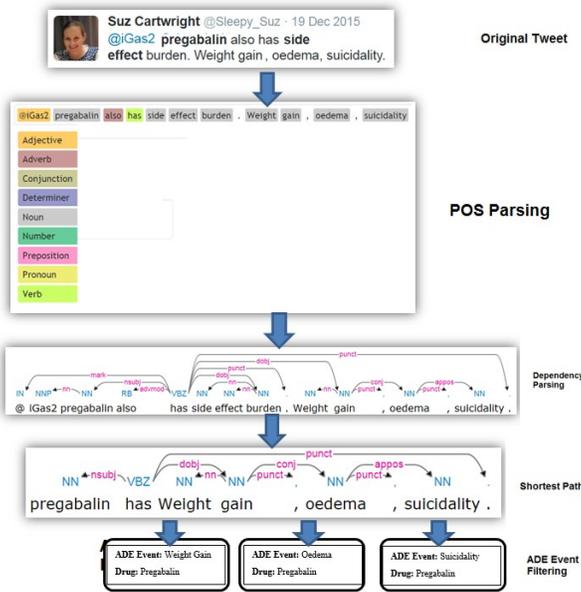


Figure 3: The Twitter Crawler Tagging Process.

In an attempt to demonstrate the usefulness of our framework and the benefits of using Thick Data for physicians to learn about patient insights, we used our framework to prototype a simple community conversation monitor. In this prototype we assumed that the physician need to create a visible profile over twitter where patients can use it for communication. The community conversation monitor help the physician to localize conversations and visualize them in a time line according to a selected ADE like pain or reaction to certain medication. Figure 4 illustrate the structure of the community conversation monitor.

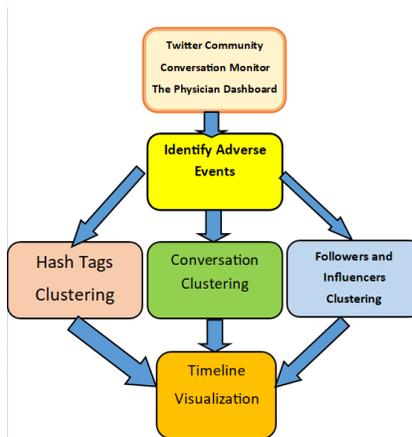


Figure 4: The Structure of the Community Conversation Monitor.

The conversation clustering component uses three functions: get-patients (), lookup-conversations () and scale-conversation (). The output of selecting this component from the physician dashboard will provide qualitative visualizations of the conversations in the time line selected through the dashboard. Figure 9 provide a snapshot of a conversation timeline.

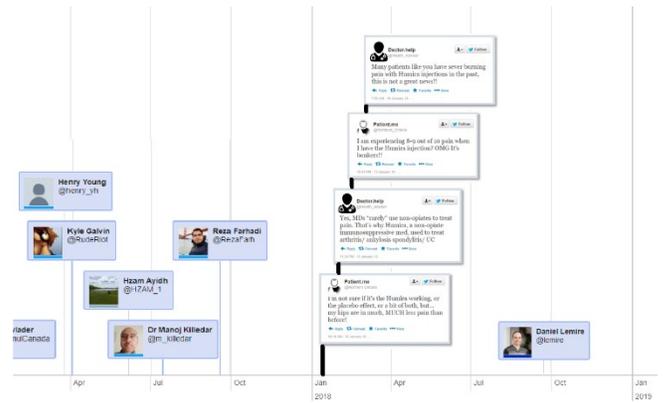


Figure 9: The Conversation Timeline.

The community conversation monitor provides the physician with a chance to monitor and amplify adverse event appearances as well as to identify key conversations with patients on a regular basis. The timeline will be provide the physician with a valuable tool for community engagement and learning about patients insights. The conversations are supplemented with real-time photos. It is also a social tool to discover followers, influencers and trendy topics through hashtags.

### Conclusions

As healthcare is becoming more patient-centric, and outcome- and value-driven, it is increasingly important that we listen to the patient's voice. Thick data researchers have provided us with the general guidelines and

the importance of the patient opinions expressed on social media—specifically on Twitter—may provide physicians and hospitals with valuable insight when it comes to measuring quality and patient experience. In this paper we introduced a framework based on identifying conversations around medications adverse events between patients and caregivers. The framework includes three major components: Conversation clusters, conversation topic modelling and conversation outcome learning. The paper also describe a porotype that implement the first two components for the purpose of providing physicians with the conversation clusters around adverse events and followers. The prototype provide qualitative information that increase community engagement and a visual facility for learning the patients insights. This work is an ongoing research that expected to produce more qualitative and quantitative information about conversations between patients and caregivers.

## References:

- [1] Bobbi Brown, Surviving Value-Based Purchasing in Healthcare: Connecting Your Clinical and Financial Data for the Best ROI, Health Catalyst White paper, 2019, Available Online: <https://www.healthcatalyst.com/white-paper/surviving-value-based-purchasing-html>
- [2] Matthew P. Manary, William Boulding, Richard Staelin, and Seth W. Glickman, The

Patient Experience and Health Outcomes, New England Journal of Medicine 368(3), January 17, 2013 Available Online: [https://www.researchgate.net/publication/233994409\\_The\\_Patient\\_Experience\\_and\\_Health\\_Outcome](https://www.researchgate.net/publication/233994409_The_Patient_Experience_and_Health_Outcome)

[3] Jason Verge, Study Identifies Common Pain Points in Big Data Projects, The Data Center Knowledge, Jun 16, 2015, Available Online: <https://www.datacenterknowledge.com/archives/2015/06/16/study-identifies-common-pain-points-in-big-data-projects>

[4] Justin Gressel, Improve Patient Satisfaction: 5 Things Healthcare Organizations Can Learn From Disney, Healthcatalyst, April 2, 2015, Available Online: <https://www.healthcatalyst.com/improve-patient-satisfaction-5-lessons-from-disney>

[5] Jinan Fiaidhi and Sabah Mohammed, Thick Data: A New Qualitative Analytics for Identifying Customer Insights, IEEE IT Professional ( Volume: 21 , Issue: 3 , May-June 1 2019 ), Pages: 4 - 13

## Acknowledgment

The authors would like to thank Dr. Nada Philip for her encouragement to publish this short summary of our recently published paper at the IEEE IR Professional.



#### CALL FOR PAPERS

HIT Research Group and SESBASS are joining forces to bring together researchers with diverse skills and knowledge who share common goals, enabling them to discuss and develop projects on transforming healthcare with technology, innovation and cross discipline collaboration. Talks, presentations and posters will focus on:

- Digital Health Technologies
- Clinical & Health Research for Well-Being & Human Performance
- Modern Biotechnology
- Bioinformatics

#### CONTACT

##### Symposium Coordinators:

Dr. Jinan Faiidhi, and  
Dr. Brenda Magajna  
[phd.ses@lakeheadu.ca](mailto:phd.ses@lakeheadu.ca)

##### WEBSITE:

<https://hitsesbass.weebly.com/>

##### Symposium Steering Committee:

Dr. Carlos Zerpa  
Dr. Taryn Klarner  
Ms. Katelyn Varga  
Dr. Eryk Przysucha  
Dr. Amarjit Chahal  
Dr. Robert Jackson



# TECHNOLOGY FOR HEALTH & WELL-BEING 2019 SYMPOSIUM

**OCTOBER 25-27, 2019**

**"TRANSFORMING HEALTHCARE WITH  
INNOVATIONS IN BIOTECHNOLOGY, HEALTH  
SCIENCES AND SMART MEDICAL DEVICES"**

#### Schedule

Friday, October 25	Poster Session (2-4PM) Sleeping Giant Brewery Visit (5-8PM)
Saturday, October 26	Keynote Speaker (9-10AM) Digital Health Technology Session (10-12PM) Clinical and Health Research Session (1-4PM)
Sunday October 27	Modern Biotechnology Session (9-12PM) Bioinformatics, Imaging and Personalized Health (1-4:30PM) Banquet (6-8PM)

**FACULTY, STUDENTS AND PROFESSIONALS ARE  
ENCOURAGED TO PARTICIPATE**

#### EMAIL YOUR WORKSHOP ABSTRACT (ONE PAGE/MS WORD)

- Title
- Author and Affiliation
- Introduction
- Method or Theory
- Experiments, Examples or Prototyping
- Conclusions
- References

#### Poster Template (48x36) Download from:

[https://www.makesians.com/SciPosters\\_Templates.aspx](https://www.makesians.com/SciPosters_Templates.aspx)

#### Registration Fees:

Symposium fees cover the whole symposium.  
Faculty/Other \$100 CAD  
Students/Postdocs \$50 CAD



e-Health Technical Committee