Topic Modeling in Opioid Dependence Treatment Reviews

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Introduction

In 2017, opioids caused 47,600 overdose deaths in the United States[1]. Medication Assisted Treatment for opioid addiction, such as Suboxone (Buprenorphine/naloxone), is effective during treatment, but adherence is poor. People who have been treated for opioid addiction or who are considering treatment, visit online forums to share experiences and seek advice from peers. Providers can learn from an analysis of these reviews how to anticipate and prioritize patients' concerns. In this study, we investigate the effectiveness of topic modelling as a strategy to identify a meaningful set of a topics related to opioid dependence treatment from reviews posted to Drugs.com. In this study, we performed topic modeling over sentences, rather than posts, because unlike past analysis of social media on opioid use[2], we were interested in attitudes about treatment (barriers and benefits) that impact health behaviors such as acceptance of medication assisted treatment for addiction[3].

Methodology

We collected 918 review posts from Drugs.com using two keywords: "Suboxone" or "Buprenorphine/Naloxone". We used web scraping to collect all posts that include the targeted keywords then performed the preprocessing steps as shown in Figure 1. For extracting topics, we used Latent Dirichlet Allocation (LDA), using the Mallet based approach. We experimented with different numbers of topics and words per topic. We also compared computing topics over individual sentences and over complete posts. To determine the best topic modeling parameters, we considered a quantitative measure (coherence scores calculated by Gensim's coherence model) and a qualitative review of the three top-ranked sentences for each topic. The final topic labels were assigned by the authors and differences were resolved by discussion.
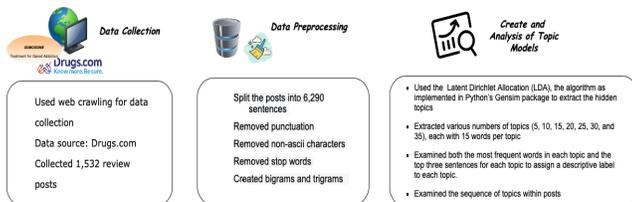

Figure 1. The system Methodology

Topic_Perc_Contrib	Top words	Top 3 sentences	Topic Label
0.1273	life, save, change, live, normal, saved, super, horrible, marriage, manage	This medicine has saved my life and changed my life drastically. Suboxone not only changed my life, it saved my life. It literally saved my life...and gave me the *freedom* to live the life I wanted to live.	Life Saver

Table 1. An example of top keywords and 3-top ranked sentences for one topic label created by Mallet
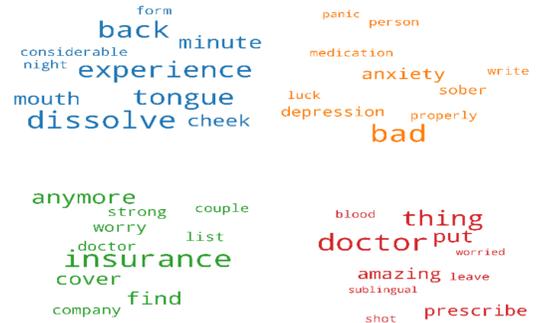

Figure 2. An illustration of some examples of topics; they correspond to oral sensation, side effects, insurance, and doctor visit

Results

We found that topic modeling with 25 topics and 15 words per topic and modeling over sentences gave the most meaningful topics. Another finding was that, as compared to looking at posts, it was easier to select a label based on the top sentences and keywords model (Table 1).

We also observed that most posts followed a similar pattern such as a description of how the individual became addicted (background, threat); how they started Suboxone during withdrawal (action); how the treatment impacted their lives positively (benefits) or negatively, and sometimes the difficulties that they had with treatment (barriers).

Conclusions

Topic modelling over drug reviews can provide useful insights regarding patient experience with addiction treatment. The top cited concerns of the patients include "side effects", "doctor visits", "insurance", and "family". The models developed in this study can be used to analyze other user-generated texts or to organize user beliefs and experiences into an ontology in our future studies. These models also can be used as input features for predictive models.

Bibliography

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