

# Patient-Reported Outcomes of Opioid-Induced Constipation as Identified Through Social Media

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## Background

Opioid-induced constipation (OIC) is the most common adverse effect associated with prolonged use of opioids; it has been estimated that between 40% and 95% of patients develop OIC (Kumar et al, 2014). OIC is persistent, and may be more distressing than the pain of the condition itself (Morlion et al, 2015). Thus, in addition to its clinical burden, OIC likely results in a high patient burden and a negative impact on patients' quality of life (QOL).

A recent literature review identified 13 studies on the patient-reported impact of OIC as measured using QOL instruments or from qualitative research (Kennedy-Martin et al, 2017). The findings from these studies clearly showed that QOL is significantly impaired in patients with OIC versus patients without OIC and that patients with OIC have been found to have similar or worse QOL compared with populations with other chronic or pain conditions. As well as global distress associated with current OIC, patients have anticipatory anxiety, which is burdensome and may increase over time.

It is now widely acknowledged that it is important to gather the patient perspective of the impact of disease and treatment (Rothman et al, 2007). Individual studies as reported in literature review provide important insights but are often limited to small sample sizes and there may be participant bias.

Social media are dynamic and interactive computer-mediated communication tools that have acquired high penetration rates in the general population in high-income and middle-income countries since the early 2000s (Grajales et al, 2014). Facebook is the most popular social media site in the world: it has 1 billion active users, 580 million of whom visit it daily (Capurro et al, 2014). Analysis of information shared on public social media accounts provides an opportunity to inexpensively access an enormous dataset and has the advantage of few practical constraints. As an example, a systematic review of 127 studies that used Twitter for health research reported that 56% of these involved content analysis of the tweets (Sinneberg et al, 2017).

## Objective

The aim of this exploratory project was to use text mining to better understand the patient-reported impact of opioid-induced constipation (OIC) as discussed in social media forums such as publicly accessible Twitter, Facebook, user and patient forum posts.

### What is text mining?

Text mining is the term used to describe the process by which important information can be found within documents in an electronic format using computer technology. In much the same way that someone can read a newspaper and pick out salient facts, opinions, and inferences, we emulate this process using computer coding based on rules and algorithms. Text mining may also be referred to as 'natural language processing' or 'computational linguistics'.

## Method

This was an exploratory project that used text mining techniques. We used web crawlers (Visual Web Spider/Win Web Crawler) to visit websites likely to contain information relevant to OIC. Any page containing a mention of terms related to OIC (e.g. OIC, opiate induced constipation, opiate related constipation, opiate constipation, opiate-induced constipation, opioid-related constipation, opioid constipation) was saved for further processing. The crawl depth<sup>1</sup> was set to level 4 and this yielded over 40,000 candidate pages. Where websites disallowed text crawling in their terms of use, the URLs were excluded.

The identified pages were text mined to extract mentions of symptoms associated with OIC. To do this, we built a machine learning-based application using GATE Learning Framework (<https://github.com/GateNLP/gateplugin-LearningFramework/wiki>) and a training corpus created specifically for this application. A model was built using a training corpus containing positive and negative examples, evaluated against a gold standard corpus and ultimately deployed in the application pipeline to process hitherto unseen records (web pages). This involved the use of a Library for Support Vector Machines (LIBSVM) classifier at the sentence level to identify documents containing sentences with phrases of significance.

The narrative content of the posts was anonymised and analysed manually. All relevant results were exported to an SQL database. We generated a feature-rich CRUD<sup>2</sup> web application to enable direct access to the results with full search/filter and export functionality. Doing this facilitated the selection of records that mentioned the impact of OIC on the person. These were then exported from the database and the results presented using data visualisation packages (QlikView<sup>®</sup> and Microsoft Power BI).

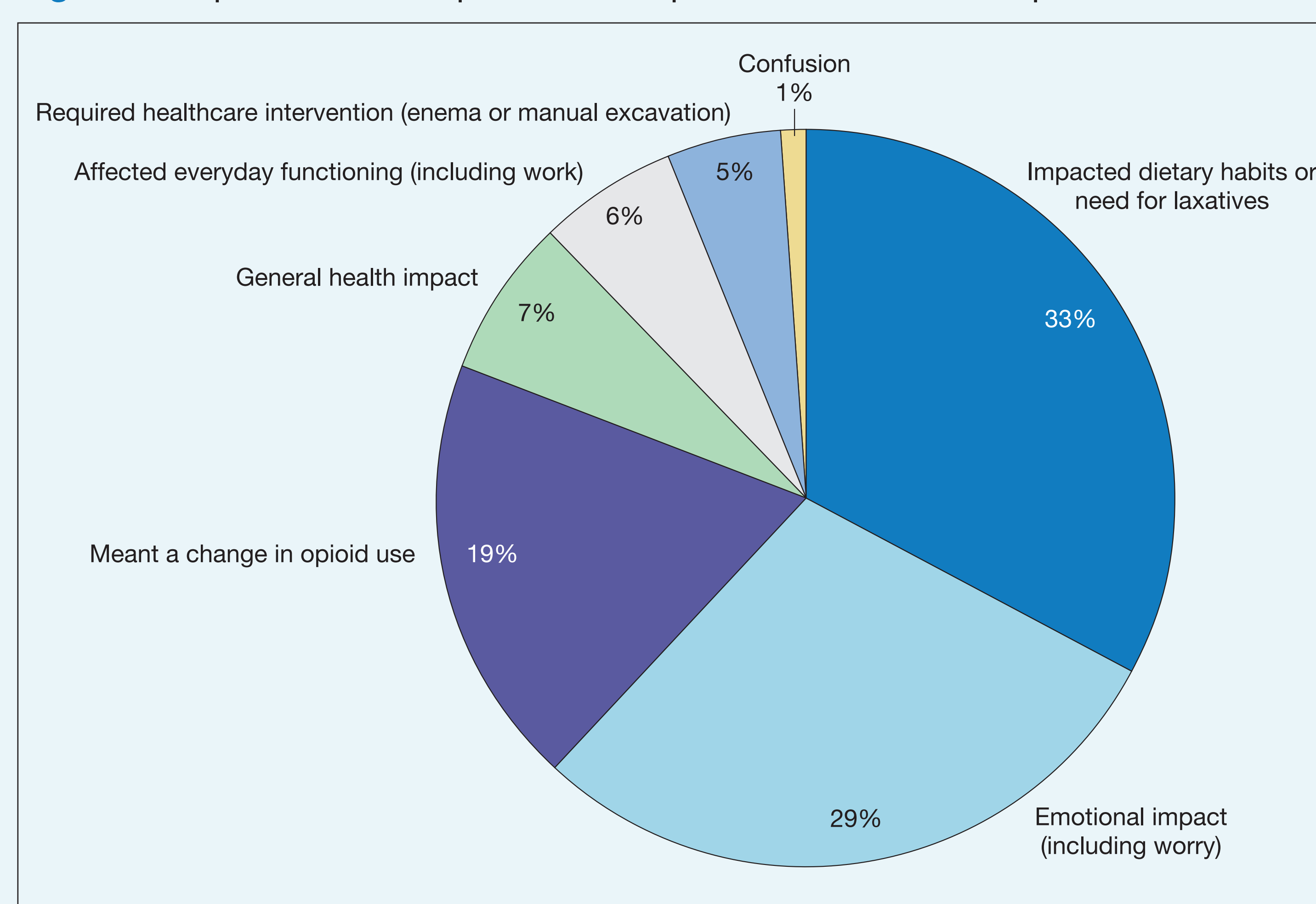
<sup>1</sup>The crawl depth is the number of levels of referred links the crawler will follow: a setting of 1 will follow links only from the first page, level 2 follows links from the first page plus links on referred pages, etc.

<sup>2</sup>Create, Read, Update, and Delete operations are the basic manipulations of database records.

## Results

Of the 42,000 web-pages retrieved, 122 described the patient-reported impact of OIC. There were 40 posts that spoke about the patient-reported impact of OIC on dietary habits or the need for laxatives (with an additional six posts speaking about the need for enemas or manual excavations). There were 36 posts describing the emotional impact (including worry) associated with OIC, with 23 posts describing how OIC had necessitated a change in opioid use. The impact of OIC on general health and everyday functioning (including work) were other topics that patients discussed (nine and eight posts, respectively). **Figure 1** shows the impact on patients as reported.

**Figure 1:** Impact of OIC on patients as reported in social media posts



## Conclusions

Using data from social media posts, we identified the ways in which OIC impacted the lives of patients. These ranged from having to change their behaviour which could include changing diet, taking laxatives to try and minimise the effect of OIC or even reducing their opioid use to try and reduce OIC. There was also evidence of OIC impacting emotional well-being as well as functioning and general health.

More generally, this exploratory research project shows that text mining of social media posts can be an important source of insight on the burden of a disease. Researchers can quickly gain access to very large amounts of data and the insights could be invaluable when designing further qualitative or quantitative research, in better understanding the impact of a condition on a patient, or when generating a conceptual model.

As the use of social media is in its infancy, many questions remain regarding ethics, privacy, data ownership and information quality; however, the role of social media as a tool for better understanding the patient perspective is very exciting.

## References

- Capurro D, Cole K, Echavarría MI, et al. The use of social networking sites for public health practice and research: A systematic review. *J Med Internet Res* 2014;16:e79.
- Grajales FJ 3rd, Sheps S, Ho K, et al. Social media: A review and tutorial of applications in medicine and health care. *J Med Internet Res* 2014;16:e13.
- Kennedy-Martin T, Krauter E, Cai B, et al. A literature review of the quality of life burden of opioid-induced constipation. Presented at 22nd International ISPOR Meeting 2017 (Poster 72912).
- Kumar L, Barker C, Emmanuel A. Opioid-induced constipation: Pathophysiology, clinical consequences, and management. *Gastroenterol Res Pract* 2014;2014:141737.
- Morlion B, Clemens KE, Dunlop W. Quality of life and healthcare resource in patients receiving opioids for chronic pain: A review of the place of oxycodone/naloxone. *Clin Drug Investig* 2015;35:1-11.
- Rothman ML, Beltran P, Cappelleri JC, et al; Mayo/FDA patient-reported outcomes consensus meeting group. Patient-reported outcomes: Conceptual issues. *Value Health* 2007;10 Suppl 2:S66-75.
- Sinneberg L, Bottenheim AM, Padrez K, et al. Twitter as a tool for health research: A systematic review. *Am J Public Health* 2017;107:e1-e8.



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