

# Reddit Users' Questions and Concerns about Anesthesia

Khalid El-Jack,<sup>1</sup>  Korey Henderson,<sup>2</sup>  Anietie U. Andy,<sup>3</sup>  Lauren Southwick,<sup>4</sup> 

## Abstract

**Background:** Patients utilize social media in search of support networks. Reddit is one of the most popular social media sites and allows users to anonymously connect. Anesthesia patients are actively using Reddit to discuss their treatment options and experiences within the medical system. **Methods:** Posts published on an active Reddit forum on Anesthesia (i.e., /r/Anesthesia) were used. Big Query was used to collect posts from /r/Anesthesia. We collected 3,288 posts published between December 2015 and August 2019. We collected a control group of 3,288 posts from a Reddit forum not related to Anesthesia, /r/AskReddit. Using latent Dirichlet allocation (LDA) we extracted 20 topics from our data set. The LDA topic themes most associated with posts in /r/Anesthesia compared to the control group were determined. **Results:** LDA analysis of posts in /r/Anesthesia relative to the control group produced six distinct categories of posts (Table 1). The posts most associated with /r/Anesthesia when compared to the control group were posts belonging to the "Physician-Patient Experience" category (Cohen's  $d = 0.389$ ) while the posts least associated with /r/Anesthesia were from the "Uncertainties" category of posts (Cohen's  $d = 0.147$ ). Example experiences from members of the /r/Anesthesia forum highlight subjective experiences of patients undergoing anesthesia. **Conclusions:** The language used on social media can provide insights into an individual's experience with anesthesia and inform physicians about patient concerns. Anesthesiologists are poised to address these concerns and prevent anonymous misinformation by providing verified physician insights on the forum /r/Anesthesia.

**Key Words:** Social Media; Facebook; Reddit; Twitter; Anesthesia (Source: MeSH-NLM).

## Introduction

Annually, there are over 230 million major surgical procedures requiring anesthesia performed globally.<sup>1</sup> Anesthesia is a medical treatment that prevents patients from feeling pain during surgery through the use of drugs called anesthetics.<sup>2</sup> Previous research reports that patients express significant anxiety in the perioperative setting regarding topics such as anesthesiologist error, waking up during surgery, or not waking up from surgery.<sup>3</sup> One study of more than 15,000 patients found that anxiety was the number one response to the question: "What was the worst thing about your operation?," outpacing both 'pain' and an 'inability to carry out usual activities.'<sup>4</sup> Anxiety is especially important because it can impact all aspects of anesthesia such as the preoperative visit and induction.<sup>4</sup> For example, anesthetic complications associated with perioperative anxiety have been reported to extend the length of recovery periods and hospital stays.<sup>5</sup>

With the advent of the Internet, patients now often use online searches to answer their health-related questions. Prior research has shown that 70–80% of Internet users seek health information online about symptoms, treatments, and medications.<sup>6</sup> Asch and colleagues (2018) found that in the seven days prior to an ED visit, 15% of Google searches, a prominent search engine, were health-

related.<sup>7</sup> In addition to online search engines, patients also utilize social media platforms to obtain health information and connect with other patients.<sup>8,9</sup> In fact, one study found that more than 40% of patients use social media platforms to obtain health-related information and this proportion is pronounced among 18–24 year olds.<sup>10,11</sup> Previous research found that patients use and consult the following social media platforms, Facebook, Instagram, Twitter, TikTok, and Reddit, for health-related information gathering and exchange.<sup>10,11</sup>

Facebook and Instagram, both owned and operated by Meta Platforms Inc., are two prominent social media platforms with over three billion users and over one billion users globally, respectively.<sup>12,13</sup> Both Facebook and Instagram have demonstrated cases of users sharing patient education information and creating supportive communities. One study on breast cancer found over 600 Facebook groups with over a million users were utilized for breast cancer awareness, fundraising, and support-seeking.<sup>14</sup> Wong and colleagues (2019) note that patients use Instagram to review other cases of their medical conditions throughout their patient journey.<sup>15</sup> Health information exchanges on Twitter, TikTok, and Reddit are garnering research attention. A large body of research found that Twitter and TikTok, a short video-sharing application, are growing

<sup>1</sup> Third-year Medical Student. Perelman School of Medicine, Philadelphia, USA

<sup>2</sup> Second-year Medical Student. Perelman School of Medicine, Philadelphia, USA

<sup>3</sup> PhD. Center for Digital Health, University of Pennsylvania, Philadelphia, USA

<sup>4</sup> MPH. Center for Digital Health, University of Pennsylvania, Philadelphia, USA

**About the Author:** Khalid El-Jack is currently a third-year medical student at the Perelman School of Medicine in Philadelphia, PA. He is a recipient of the 21st Century Scholarship, a full tuition scholarship at his medical school.

### Correspondence:

Khalid El-Jack

Address: 3400 Civic Center Blvd, Philadelphia, PA 19104, United States

Email: [eljack10@bu.edu](mailto:eljack10@bu.edu)

Editor: Mohamed Fahmy Doheim  
Student Editors: Eugenia M. Ramos-Dávila  
& Hang-Long (Ron) Li  
Proofreader: Laeeqa Manji  
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sources of health information dissemination to patients.<sup>16,17</sup> Reddit is among the most popular social media websites, ranking fifth for Internet traffic in the United States in 2018.<sup>18</sup> Reddit has been demonstrated to be an effective source of user-generated information on dermatology-related, mental health, cardiovascular, COVID-19, and cancer questions and issues.<sup>18-23</sup> Despite the Reddit platform being an important online space for health-related information sharing, there is limited research on how Reddit users discuss anesthesia questions and concerns.<sup>18-24</sup> Our analysis specifically analyzes and characterizes Reddit users' questions and concerns about anesthesia.

## Methods

We extracted posts published on an active Reddit forum on Anesthesia ([/r/Anesthesia: www.reddit.com/r/Anesthesia/](https://www.reddit.com/r/Anesthesia/)). [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) has 3,000 members as of August 2021 and is titled, "All anesthetic topics, all the time." Other forums related to anesthesia exist on Reddit, namely [/r/Anesthesiology](https://www.reddit.com/r/Anesthesiology/); however, posts on [/r/Anesthesiology](https://www.reddit.com/r/Anesthesiology/) are more related to the professional field of Anesthesiology rather than the patient experiences expressed via the forum [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/). The forum [/r/AskReddit](https://www.reddit.com/r/AskReddit/) was selected as a control group because it focuses on discussions around general topics as opposed to [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) which is specifically tailored to discussions focused on patient experiences regarding anesthesia. Big Query, a data storage that includes posts, comments, and meta-data from Reddit was used to collect posts from [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) and [/r/AskReddit](https://www.reddit.com/r/AskReddit/).<sup>25</sup> This study was considered exempt under University of Pennsylvania Institutional Review Board guidelines as it involves the analysis of publicly available data.

We extracted 20 topics from our data set which included posts from [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) and the control group, [/r/AskReddit](https://www.reddit.com/r/AskReddit/), using the topic modeling algorithm, latent Dirichlet allocation (LDA), which groups words in documents that occur in the same context together.<sup>26</sup> LDA assumes that topics are made up of a combination of words and that Reddit posts are made up of a mixture of topics. Based on the words associated with a topic, a label can be assigned. For example, LDA may cluster the words (January, February, March April, May) as "months of the year." The LDA topic themes most associated with posts in [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) compared to the control group were determined.

## Results

We collected 3,288 posts published between December 2015 and August 2019 on [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/). We also collected a control group of 3,288 posts from the Reddit forum [r/AskReddit](https://www.reddit.com/r/AskReddit/). [Table 1](#) shows the topics most associated with [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) posts and the effect sizes measured using Cohen's D.

LDA analysis of posts in [r/Anesthesia](https://www.reddit.com/r/Anesthesia/) relative to the control group produced six distinct post categories ([Table 1](#)). The categories in order of highest association to lowest from [r/Anesthesia](https://www.reddit.com/r/Anesthesia/) posts when compared to a control group belonged to "Patient-Physician Experience" (Cohen's  $d=0.389$ ), "Medication" (Cohen's  $d=0.365$ ), "Health Care Infrastructure" (Cohen's  $d=0.336$ ),

"Procedures" (Cohen's  $d=0.304$ ), "Personal Inquiries" (Cohen's  $d=0.201$ ), and "Uncertainties" (Cohen's  $d=0.147$ ).

[Table 1](#) displays themes, correlation values with valence, and illustrative narrative posts. Please note, posts were edited, and any personally identifying information was removed. The category of highest association, "Patient-Physician Experience", included posts surrounding relationships between members of the care team and patients. An illustrative example of a post from this category was "I was still a little on edge, but my amazing and caring anesthesiologist basically informed me that given my health, she wouldn't even bother describing extreme risks".

## Discussion

Despite previous research demonstrating that Reddit has become a widely used tool for sharing health information and seeking support for medical concerns, there is limited research on how Reddit users discuss anesthesia questions and concerns.<sup>18</sup> Using latent Dirichlet allocation (LDA) techniques, this study characterized the language used in posts published on an anesthesia forum by users who express and seek support around anesthetic procedures compared to a control group of posts from an unrelated forum. The language differences were found to reflect the questions and concerns from the Reddit community [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/). This study revealed six distinct categories of posts within the subreddit among users: "Patient-Physician Experience" (Cohen's  $d=0.389$ ), "Medication" (Cohen's  $d=0.365$ ), "Health Care Infrastructure" (Cohen's  $d=0.336$ ), "Procedures" (Cohen's  $d=0.304$ ), "Personal Inquiries" (Cohen's  $d=0.201$ ), and "Uncertainties" (Cohen's  $d=0.147$ ) illustrating some of the concerns regarding anesthesia which users tend to seek advice on the Reddit forum [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) ([Table 1](#)).

Our results show that the topic of "Patient-Physician Experience" (Cohen's  $d=0.389$ ) was most associated with posts in the subreddit forum [/r/Anesthesia](https://www.reddit.com/r/Anesthesia/) ([Table 1](#)). This demonstrates that the forum is utilized often to address the relationship and communication between patients and members of their care team. A potential explanation for this finding may be related to poor communication regarding postoperative care.<sup>27</sup> Most patients who undergo surgery do not have the necessary preoperative discussions with the anesthesia team to properly address the recovery experience following surgical procedures.<sup>27</sup> Gleaning from this analysis, we recommend that Reddit be used as a forum for both patients and their health care providers to address specific aspects of care that have not been discussed during the preoperative anesthesia visit. Additionally, while anesthesiologists mostly communicate on the logistical aspects of care, more time and attention are warranted to discuss non-technical information such as patients' values and goals of care.<sup>27</sup> Research has shown that patients want to be more involved with their care and seek emotional support during their care in ambulatory anesthesia.<sup>28</sup> Reddit can serve as a tool to address these types of concerns between the patient and their anesthesia providers.

**Table 1.** Latent Dirichlet Allocation Topics associated with /r/Anesthesia Posts with Correlated Words Used to Highlight the Topic and Redacted Illustrative Examples.

Category/Theme	Operational Definition	Cohen's D	Correlated Words	Redacted Illustrative Posts
<b>Patient-Physician Experience</b>	Posts surrounding relationships between members of the care team and patients	0.389	Anesthesia, surgery, procedure, sedation, anesthesiologist, patient, anesthetic, surgeon, pain, experience	Hello everybody, I underwent a procedure this morning while sedated. I came and read the pinned post in this subreddit since I had been worrying about it for weeks, and it truly helped me relax. I generally struggle with quite severe anxiety relating to my health. While getting ready this morning, I was still a little on edge, but my amazing and caring anesthesiologist basically informed me that given my health, she wouldn't even bother describing extreme risks; she only said that I might feel nauseous and have a sore throat after. I was asleep with one of the nurses holding my hand, and when I awoke, I was overjoyed. After roughly four hours of being awake, I feel great! The fear of the unknown made me worried, but I now get that it is truly okay. Thank you for your help across this forum.
<b>Medication</b>	Posts surrounding medication administration	0.365	Patient, risk, blood, propofol, dose, patients, anesthetics, pressure, drug, higher	Why does the white IV fluid hurt when it is inserted? I'm not sure what it was, but it quickly reached my brain and knocked me out in minutes Too bad it HURT LIKE HELL on my arm. Has Reynaud's been linked to this? I really struggle with that. What was this fluid, and why did they claim that some feel pain with it and others don't?
<b>Health Care Infrastructure</b>	Posts including various members of healthcare industry as a whole	0.336	CRNA, work, practice, school, medical, experience, states, nurse, job, hospital	I am currently completing a respiratory therapy AA program in California. I am very interested in pursuing anesthesia of some kind, and I am deciding between going to medical school to become an anesthesiologist, moving out of state to become an anesthesiology assistant, or returning to nursing school after I graduate from respiratory school and possibly pursuing a CRNA in the future. Can someone please describe the distinctions between the roles in terms of autonomy and the duties of each job?
<b>Procedures</b>	Posts surrounding specific procedures requiring anesthesia administration	0.304	Surgery, pain, block, body, nerve, heart, hospital, hours, spinal, epidural	I'm going to have a tummy tuck, and I read an article about someone who had general anesthesia and woke up, but they were paralyzed from the medication given along with the general anesthetic, so they couldn't tell anyone they were awake. I'm very scared right now! This surgery takes six hours! I hope I don't wake up during any of it, but if I do, I'd like to know how to let someone know so they can put me back to sleep!
<b>Personal Inquiries</b>	Posts including direct questions regarding anesthesia	0.201	Question, future, important, making, fact, learn, true, difficult, situation, personal	I have a cardiac problem and have a procedure tomorrow. I'm seeking feedback before scheduling this sedated procedure. For the last few years, I've experienced a persistent cough, shortness of breath, and periodic chest discomfort that feels like a heart attack (along with pain in my left arm, jaw, and back), as well as irregular heartbeats while lying down.... I'm worried that because I'm unsure of whether I have a problem or not, I won't know whether I should be sedated for the surgery until I get more information. Even though it's a colonoscopy and not surgery, I'm worried.
<b>Uncertainties</b>	User posts regarding patient worries and fears	0.147	I'm, don't, shit, stop, smoking, give, smoke, week, anxiety, die	Help me. I spent three weeks without doing any drugs. A friend of mine invited me out to drinks last Thursday (also something I must stop, but anyway). I let him know that I stopped doing drugs and that I needed to keep clean (especially for two weeks) since I am scheduled to undergo major surgery on April 15... Does anyone here have any information on whether I should be able to have the surgery? Has anyone ever smoked meth and felt sick afterwards?

Our analysis demonstrates that patients utilize Reddit as a resource to discuss highly personal questions and concerns regarding anesthesia. These questions may be stigmatizing and difficult to talk about during the preoperative anesthesia visit. For example, a redacted illustrated post highlighted concerns about methamphetamine use impacting the likelihood of having surgery: "Does anyone here have any information on whether I should be able to have the surgery? Has anyone ever smoked meth and felt sick afterward?" (Table 1). The patient-provider discussion of substance use during the preoperative period is paramount so that their anesthesiologists can understand potential drug interactions, predict tolerance to some anesthetics, and recognize drug withdrawal so that they are prepared to manage all these factors in the perioperative period.<sup>29</sup> Since Reddit requires only an email address to sign up, it ensures anonymity to facilitate easier sharing of emotionally sensitive topics such as these which can be beneficial as some studies have shown that patients tend to under-report substance use in the hospital setting.<sup>18,30</sup>

It would be incredibly advantageous for the field of anesthesiology if providers knew more about social media's utility in facilitating conversations that could address patients' concerns that have either not been discussed previously or ones that are more difficult to talk about due to the sensitivity of the topic. We believe this would encourage more anesthesiologists to feel compelled to engage with patients on these platforms including the subreddit /r/Anesthesia. For example, social media sites such as Twitter have already been used by anesthesiologists to converse over research topics. In fact, anesthesiology journals with a "highly performing Twitter account" are more likely to have an increase in impact factor than those who do not.<sup>31</sup> In addition to this, sites like Twitter have been utilized for live interaction during anesthesiology research conferences.<sup>31,32</sup> The easy accessibility and wide usage of social media should poise anesthesiologists to address the concerns and questions of its users, including those demonstrated on the subreddit community /r/Anesthesia.

While Reddit may be helpful in alleviating the anxiety of some patients regarding anesthesia, it still can present a large opportunity for spread of misinformation across the forum. A major concern with crowdsourcing sensitive healthcare information online is the lack of ability to verify information despite it requiring immense expertise. There often is a lack of editorial responsibility, peer review, and accountability on social media networks which can put into question the authenticity of information.<sup>33</sup> Despite this, our analysis demonstrates how Reddit can still be of value for health care providers to interact with patients who have questions or concerns regarding anesthesia if appropriate provider disclosures and safeguards are put into place.

### limitations

Limitations of this study include retrospective design, selection and responder bias. We only identified content on one subreddit thread and other threads might yield different themes and sub-themes. The study sample consists of social media users and is not representative of the general population. We also only collected posts in the English language, and non-English posts could yield different themes. Despite these limitations, social media platforms provide an unstructured and accessible venue for users to share their experiences regarding anesthesia procedures.

## Summary – Accelerating Translation

**Title:** Reddit Users' Questions and Concerns about Anesthesia

**Main Problem to Solve:** Reddit users of the forum r/Anesthesia utilize the forum for anonymous discussion of questions and concerns regarding upcoming procedures requiring anesthesia. Due to the ability to post anonymously, there is risk for misinformation being spread across the platform which may be potentially harmful for patients.

**Aim of Study:** Our study aims to analyze discussions patients are having across the forum r/Anesthesia to better inform anesthesia providers of ways to better serve their patients both online and in the peri-operative setting.

**Methodology:** Posts published on an active Reddit forum on Anesthesia (i.e., /r/Anesthesia) were used for analysis. Big Query was used to collect posts from /r/Anesthesia. We collected 3,288 posts published between December 2015 and August 2019 across the forum as well as a control group of 3,288 posts from a Reddit forum not related to Anesthesia, /r/AskReddit. Using latent Dirichlet allocation (LDA) we extracted 20 topics from our data set. The LDA topic themes most associated with posts in /r/Anesthesia compared to the control group were determined.

**Results.** LDA analysis of posts in /r/Anesthesia relative to a control group produced six distinct categories of posts (Table 1). The posts most associated with /r/Anesthesia when compared to the control group were posts belonging to the "Physician-Patient Experience" category (Cohen's  $d = 0.389$ ) while the posts least associated with /r/Anesthesia were from the "Uncertainties" category of posts (Cohen's  $d = 0.147$ ). Example experiences from members of the /r/Anesthesia forum highlight subjective experiences of patients undergoing anesthesiology. For example, one user states, "I was asleep with one of the nurses holding my hand, and when I awoke, I was overjoyed. After roughly four hours of being awake, I feel great! The fear of the unknown made me worried, but I now get that it is truly okay. Thank you for your help across this forum." This demonstrates the beneficial aspects of utilizing r/Anesthesia for social support.

**Conclusions:** Our study demonstrates Reddit data can provide utility for physicians to engage with patients who have concerns regarding anesthetic procedures. Furthermore, data from social media forums such as Reddit may be leveraged to identify ways in which patients lend support to one another in an anonymous social setting. Future research has the potential to expand this methodology to other subspecialties to elucidate patient concerns across the spectrum of medicine.

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