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ANASTASIOS G. ROUMELIOTIS, BS[1]; PETER R. SWIATEK, MD[1]; CODY GOEDDERZ, BS[1]; PRIYANKA MATHUR, BS[1]; YUE ZHANG, BS[1]; ERIK B. GERLACH, MD[1]; SRIKANTH N. DIVI, MD[1]; WELLINGTON K. HSU, MD[1]; AND ALPESH A. PATEL, MD, MBA[1]

[1]*Department of Orthopaedic Surgery, Northwestern University Feinberg School of Medicine, Chicago, IL, USA*

ABSTRACT

Background: Social media offers a powerful and expanding platform for sharing the patient experience with a large audience through an unsolicited perspective. The content may influence future perceptions around surgical care.

Objective: To analyze publicly available content on a major social media outlet related to microdiscectomy surgery based on perspective, location, timing, content, tone, and patient satisfaction.

Methods: A query of content was performed for the study period 1 January 2019 to 1 January 2021. Relevant content was identified by hashtag "#microdiscectomy." The initial query returned 10,050 publicly available posts, and the 1500 most "liked" posts were included for evaluation. Content was subsequently classified, characterized, and analyzed.

Results: Patients created 72.9% of microdiscectomy-related content, and spine surgeons created 23.5%. Regarding region, 77.0% of posts originated in the United States. The majority portrayed the patient experience in the postoperative phase of care (86.0%), with the primary reference to activities of daily living (56.9%). Only 1.7% of posts depicted the surgical incision site. The connotation of posts was deemed positive in 78.5% of cases. Of the posts referencing satisfaction, 98.3% depicted patient satisfaction with the surgical outcome. Patient posts in the postoperative phase of care (>1 week after surgery) were more than 2 times as likely to express positive tone (OR = 2.07, $P \leq 0.013$) with their clinical course compared with patient posts outside the postoperative period.

Conclusions and Clinical Relevance: Overall, social media posts are written in a positive tone, express satisfaction with surgical outcome, typically occur in the postoperative period of care, and depict activities of daily living. These popular mechanisms of communication, such as Instagram, offer spine surgeons unique insights into the true patient experience and may provide an opportunity for surgeons to assess patient feedback, influence patient perceptions, and enhance delivery of lumbar spine care.

Level of Evidence: 5.

Minimally Invasive Surgery

Keywords: microdiscectomy, social media, patient-reported outcomes, lumbar spine, Instagram

INTRODUCTION

With more than 300,000 procedures performed each year, microdiscectomy surgery has become one of the most common spine procedures performed in the United States. Typically performed for treatment of lumbar disc herniations that fail to resolve with conservative measures, microdiscectomy has evolved to be a truly minimally invasive procedure, with the use of mini-incisions, microscopes, and/or tubular retractors.[1] Minimally invasive spine surgery (MIS) has become popularized in the past decade, with microdiscectomy being the most common type of MIS performed. Numerous studies have identified patient- and procedure-specific factors associated with improved outcomes after MIS. These studies use traditional patient-reported outcome measures or health-related quality of life metrics to measure the success of surgery. No study, however, has investigated how the microdiscectomy procedure is portrayed in social media, which offers a unique window into the patient perspective and potentially another means for understanding the success of surgery.

Traditionally, surgeons have relied on face-to-face encounters, various educational devices (eg, models, information brochures, etc), and telephone touchpoints to communicate, educate, and counsel their patients. Now, with the rise of social media, patients and surgeons have been exposed to an additional, unfiltered channel through which they can interact and disseminate information in real time.[2] Moreover, with the introduction

of the "hashtag" (#) on various social media platforms, patients and surgeons can have focused, thematic conversations with a broad audience.[3]

Although similar studies have analyzed various orthopedic and neurosurgical procedures and conditions, including hip arthroscopy[4] and pediatric scoliosis,[5] no study has explored the integration of social media and the patient experience in microdiscectomy and MIS. The purpose of this observational study is to analyze publicly available content shared by both patients and spine surgeons to better characterize the social media landscape on Instagram for one of the most common spine procedures in the United States: microdiscectomy surgery. Our study aims to be directionally informative for both spine surgeons and patients by elucidating content trends on one of the most popular social media outlets with regard to microdiscectomy.

METHODS

Data Acquisition

Public Instagram posts were obtained over a 2-year period (from 1 January 2019 to 1 January 2021) using Picodash,[6] an online social media analytics platform. Instagram was chosen as the primary data source over other social media platforms due to the higher volume of microdiscectomy content returned on initial survey. Posts were extracted from the database for consideration based upon their inclusion of hashtags related to microdiscectomy surgery, specifically "#microdiscectomy." While microdiscectomy has different levels of invasiveness, depending on the use of a midline incision with a Taylor retractor, a McCullouch retractor, or a Wiltse incision with a tubular retractor, most consider microdiscectomy a minimally invasive procedure. All posts were ranked according to the number of Instagram "likes," and the top 1500 microdiscectomy-related posts were analyzed. Using "likes" as a marker for influence, we chose the most "liked" posts with the intention of studying the most influential content related to microdiscectomy. All posts unrelated to microdiscectomy surgery were excluded.

A categorical classification system was used for type of media format (ie, combinations of text, photos, and videos), perspective of author of post (ie, patient, family/friend, spine surgeon, industry, etc), phase of care depicted (ie, preoperative, perioperative, postoperative, and nonoperative), region (ie, Midwest, East, West, South, Europe, etc), content depiction (ie, imaging, surgical incision site, activity of daily living, etc), tone (ie, positive, negative, and neutral), and patient satisfaction

with outcome (ie, expressing satisfaction, expressing dissatisfaction, or expressing neither).

The phase of care of the posts was identified with respect to the surgery: preoperative (>1 week before surgery), perioperative (within 1 week of surgery), postoperative (>1 week after surgery), and nonoperative. Patient sex and geographic location were also recorded. The geographic location was defined as within or outside the United States. The US posts were categorized by region according to the US Census Bureau (ie, Midwest, South, East, and West).[7] Non-US posts were stratified by continent. Two independent reviewers (1 man, 1 woman) analyzed each Instagram post and determined the characterization for each post (eg, tone, content, etc). Any discrepancies between reviewers were discussed, and consensus was reached in completion of the final dataset.

Satisfaction in the perioperative (<1 week after surgery) and postoperative periods represents the patient's overall contentment with having undergone the procedure. Microdiscectomy procedures that resulted in outcomes that aligned with patient's expectations preoperatively were recorded as posts expressing satisfaction. Similarly, if the outcome did not meet a patient's expectations, the post was reported as expressing dissatisfaction. Regarding tone, posts with the patient presenting their condition in an optimistic light with excitement for the future were documented as positive tone. On the other hand, negative tone posts depicted the patient's condition in a melancholic light with concern for the future recovery.

Statistical Analyses

Categorical variables are reported as frequency and percentages and are compared using Fisher's exact test and χ^2 test of homogeneity as indicated. Additionally, the dependent variable of "tone of post" was divided into positive and nonpositive (1 = positive, 0 = negative or neutral) tone. Negative and neutral were paired together for the odds ratio analysis due to the relatively small number of negative tone posts (2.3%) to enhance the power of the statistical analysis in determining aspects of care associated with a positive tone. Univariate odds ratios were generated for each data category for both positive and nonpositive (negative and neutral) tone. The categorical variables "sex," "phase of care," and "depiction of post" produced significant odds ratios from the entire dataset. The dataset was divided into "patient" and "spine surgeon," and univariate and multivariate odds ratios were determined using these categorical variables.

A 95% confidence interval was tabulated to assess the precision of the risk estimate. A *P* value of less than 0.05 was used as the cutoff for findings of statistical significance. Microsoft Excel (Microsoft, Redmond, WA, USA) was used for data management. Statistical analyses were performed in R, version 4.0.0, and using the logistic regression Statsmodels Python package.

RESULTS

An initial search revealed 10,050 publicly available posts tagged with "#microdiscectomy." The 1500 most "liked" posts from 1 January 2019 to 1 January 2021 were sorted and analyzed. No posts were excluded due to interrater disagreement. Overall, patients (72.9%) and spine surgeons or groups (23.5%) represented the greatest number of posts. Regarding the type of media, photo + text (83.5%) constituted the majority of posts. There was a near equitable split between men (49.1%) and women (49.7%) for the sex of the individual depicted in post. Geographically, 77% of posts originated from the United States, with the South (27.8%) and Northeast (21.7%) as the most represented regions (Table 1).

Regarding timing and phase of care, 67.5% of posts were postoperative (more than 1 week after surgery), 22.2% were perioperative (within 1 week before or after surgery), 4.3% were preoperative (more than 1 week before surgery), and 8.0% were not related to any specific operative period.

The majority of posts depicted activities of daily living (56.9%). The remaining posts depicted the operating room (8.8%), clinic scene (7.8%), radiologic imaging (7.3%), a return to sport (4.3%), among other depictions. A similar trend was seen in the primary reference category of the post captions.

The overall tone of posts was positive (78.5%), with 2.3% of posts expressing negativity and 19.3% demonstrating a neutral tone. Of the 1289 posts in the perioperative and postoperative periods, 53.5% of these posts explicitly expressed satisfaction with the surgical outcome of microdiscectomy, while 0.9% explicitly expressed dissatisfaction (Figure 1). In general, patient satisfaction and tone had a direct relationship. However, in certain circumstances there was variability.[8] For example, a patient post may have expressed dissatisfaction with current symptoms but may also be presented in the context of hope for a full recovery. This was a more common theme in individuals with active professions (eg, athletes, weightlifters, fitness trainers, etc). To better capture the expressions and feelings shared by social media users, we included a graphical representation of the most common words used in microdiscectomy-related social media content (Figure 2).
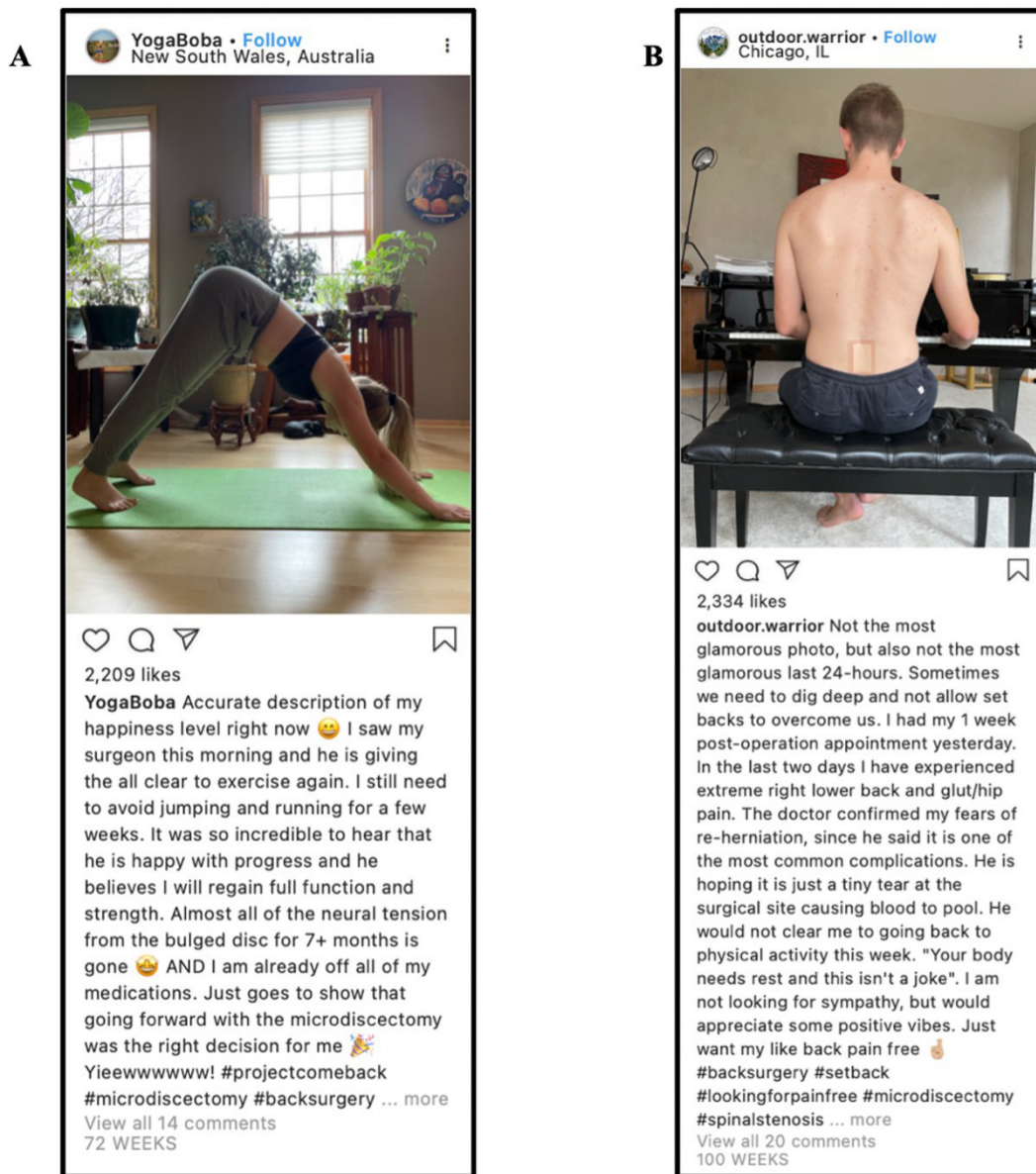
Statistical analysis comparing user demographics and tone of posts demonstrated that the overwhelming majority of posts were positive or neutral. This results

Table 1. Summary microdiscectomy Instagram post content (*N* = 1500).

Shared Content Characteristics	*n* (%)
Type of media	
Text	15 (1.0)
Video + photo + text	42 (2.8)
Video + text	257 (17.1)
Photo + text	1186 (79.1)
Original poster	
Patient	1094 (72.9)
Family/friend of patient	11 (0.7)
Spine surgeon or group	353 (23.5)
Other health care professionals	6 (0.4)
Physical therapist	16 (1.1)
Hospital	10 (0.7)
Industry	10 (0.7)
Sex	
Male	736 (49.1)
Female	745 (49.7)
Not applicable	19 (1.3)
Region	
Northeast	64 (21.7)
Midwest	38 (7.0)
South	176 (27.8)
West	307 (20.6)
Non-United States	915 (23.0)
Phase of care	
Preoperative	36 (4.3)
Postoperative	1012 (67.5)
Perioperative (<1 wk before operation)	55 (3.7)
Perioperative (<1 wk after operation)	277 (18.5)
Nonoperative	120 (8.0)
Depiction of post	
Article/poster/advertisement	57 (3.8)
Clinic scene	117 (7.8)
Operating room scene	132 (8.8)
Imaging	109 (7.3)
Surgical incision site	26 (1.7)
Surgical technique	16 (1.1)
Daily activity	854 (56.9)
Work	17 (1.1)
Sport	65 (4.3)
Physical therapy	43 (2.9)
Medication	2 (0.1)
Other	62 (4.1)
Caption primary reference	
Article/poster/advertisement	60 (4.0)
Clinic scene	46 (3.1)
Operating room scene	102 (6.8)
Imaging	95 (6.3)
Surgical site	20 (1.3)
Surgical technique	49 (3.3)
Return to daily activity	908 (60.5)
Return to work	16 (1.1)
Return to sport	66 (4.4)
Physical therapy	44 (2.9)
Medication	5 (0.3)
Other	89 (5.9)
Tone of post	
Positive	1177 (78.5)
Negative	34 (2.3)
Neutral	289 (19.3)
Post satisfaction status with outcome	
Satisfaction	690 (53.5)
Dissatisfaction	12 (0.9)

Figure 1. Examples of microdiscectomy-related social media content created by the authors of the present study to illustrate the types of posts included in the present study. (A) Patient expressing postoperative improvement in a positive tone. (B) Patient explaining complications following microdiscectomy surgery in a negative tone.

remained true even when accounting for the identity of the social media user ($P < 0.0001$), sex of user ($P < 0.0001$), region of user ($P < 0.0001$), and phase of care associated with the post ($P = 0.0001$) (Table 2).

Further analysis using the χ^2 test of homogeneity demonstrated significant differences in the post content of patient and medical professional social media users ($P < 0.0001$). Patients primarily referenced activities of daily living (76.9%), a return to sport (6.2%), and the surgical incision site (2.3%). On the other hand, medical professionals primarily referenced and depicted the operating room scene (34.9%), radiologic imaging (26.3%), clinic scene (16.9%), and article/poster/advertisement (10.0%) (Table 3).

After controlling for confounders, patient and spine surgeon posts stratified by sex showed no effect on the tone of posts ($P > 0.05$). Moreover, patient posts made in the postoperative period were more than twice as likely to express positive patient tone (OR = 2.07, CI = 1.17–3.67, $P = 0.013$) (Table 4). Posts made by spine surgeons in the postoperative period were more than 5 times as likely to be positive compared with the preoperative period (OR = 5.27, CI = 1.49–18.70, $P = 0.01$) (Table 5). Additionally, patient posts with references to

Figure 2. Word cloud representation of the most common text shared in microdiscectomy-related posts.

lifestyle (daily activity, sports, and work) were more than 3 times as likely to be expressed in a positive tone compared with posts referencing medical matters (article/poster/advertisement, imaging, incision, clinic scene, operating room scene, medication) (OR = 3.14, CI = 1.85–5.33, P < 0.0001) (Table 4).

DISCUSSION

Our study is the first of its kind to identify several unique trends in MIS and microdiscectomy surgery within the context of social media. First, patients generated more than 7000 posts in the short study period, and patient posts vastly outnumbered spine surgeons

Table 2. Comparison of user demographics and tone of post.

Demographic Variable	Positive/Neutral Post	Negative Post	P Value
Poster			<0.0001
Medical personnel[a]	372 (99.5)	2 (0.5)	
Patient/family/friend	1056 (93.6)	32 (6.4)	
Other[b]	18 (100.0)	0 (0.0)	
Sex			<0.0001
Male	733 (99.6)	8 (0.4)	
Female	729 (94.0)	26 (6.0)	
Region			<0.0001
Africa	2 (91.7)	1 (8.3)	
Asia	24 (99.1)	3 (9.9)	
Europe	467 (93.5)	8 (6.5)	
North America	605 (95.7)	20 (4.3)	
Oceania	174 (100.0)	0 (0.0)	
South America	34 (97.1)	0 (0.0)	
Phase of care			<0.0001
Preoperative	31 (85.7)	4 (14.3)	
Perioperative	325 (95.7)	5 (4.3)	
Postoperative	974 (94.5)	23 (5.5)	
Nonperioperative	116 (98.2)	2 (1.8)	

Note: Data presented as *n* (%).
[a]Includes spine surgeon or group, nonspine surgeon physician, therapist, nurse, and physician assistant.
[b]Includes hospital, law group, and implant manufacturer.

and medical professionals by a ratio of 3:1. The volume of content being produced by nonmedical professionals is substantial—providing surgeons and other medical providers a unique opportunity to understand the perspective of patients and what matters to them. Second, patients discussing microdiscectomy surgery were primarily positive in tone (78.5%), with more than half of postoperative patients producing content that directly referenced satisfaction with surgery. Last, and perhaps most interesting, is that patients and surgeons shared different types of content related to microdiscectomy. Patients primarily referenced activities of daily living and returning to "normal life," whereas spine surgeons typically shared medical imaging, images from the operating room, pictures of a clinic scene, or research articles. Although this discrepancy does not necessarily suggest a disconnect between surgeon and patient interests, it does highlight an opportunity for surgeons to better address the immediate interests of their patients (ie, postoperative pain, rehabilitation, return to activities of daily living, etc).

Microdiscectomy surgery is one of the most common spine procedures performed across the United States and generally considered a highly safe and effective procedure. According to a study that collected data from approximately 40,000 patients worldwide, 78.9% of patients undergoing microdiscectomy reported "good to excellent" results with a mean follow-up of 6.1 years.[9] The minimally invasive nature of the procedure enables quick recovery, relief of neurologic symptoms, and overall improvement in physical function with low rates of complications. Previous studies have attempted to identify key variables that contribute to higher patient satisfaction rates among microdiscectomy patients. For example, Hui et al concluded that 2 years after a discectomy, approximately 70% of patients expressed satisfaction following surgery. Preoperative obesity and depression status were the 2 main predictors for patient dissatisfaction with the surgery, while occupation and age did not appear to affect the outcome.[10–12] Similarly, our study found that nearly 80% of patients share positive feelings about microdiscectomy surgery with more than half of postoperative patients overtly expressing satisfaction. Based on our detailed review of patient content, satisfaction clearly exists on a spectrum and can be multifactorial. It is the opinion of the authors that social media offers spine surgeons and other medical professionals the unique opportunity to better understand the spectrum of "what matters" to patients through unsolicited and unfiltered patient-produced content.

Table 3. Analysis of post content by user.

User	Article, Poster, Advertisement	Clinic Scene	Imaging	Surgical Site	Operating Room Scene	Daily Activity	Work	Sport	Surgical Device/ Technique	Physical Therapy	P Value
Patients	13 (1.3)	50 (4.8)	11 (1.1)	24 (2.3)	6 (0.6)	793 (76.9)	17 (1.6)	64 (6.2)	1 (0.1)	27 (2.6)	<0.0001
Medical professionals	36 (10.0)	61 (16.9)	95 (26.3)	0 (0.0)	126 (34.9)	16 (4.4)	0 (0.0)	0 (0.0)	13 (3.6)	14 (3.9)	
Other	7 (28.0)	2 (8.0)	1 (4.0)	0 (0.0)	0 (0.0)	12 (48.0)	0 (0.0)	1 (4.0)	1 (4.0)	1 (4.0)	

Note: Data presented as *n* (%).

Few studies[4,13–15] have investigated the role of social media in measuring patient perceptions in orthopedic or neurological surgery. Only 1 study, to our knowledge, has investigated the intersection between these outlets and adult spine surgery. This study focused on scoliosis surgery and studied only 200 posts across 4 media platforms.[15] The study by Rizkalla et al in their review of spinal fusion patient Instagram posts found that the majority portrayed a positive tone (86%) and emphasized key aspects of recovery, such as activities of daily living (68.2%), postoperative rehabilitation and physical therapy (39.8%), references to the incision site/scar (8.7%), and the inclusion of imaging (4.5%).[3] Our study of Instagram content related to microdiscectomy surgery revealed similar representation with most posts by patients (72.9%) and nearly 80% of posts expressing a positive tone. Of the 1289 posts in the postoperative period, 53.5% directly expressed satisfaction with the surgical outcome, while 0.9% expressed dissatisfaction. The patients expressing a negative/neutral tone or dissatisfaction with the surgical experience were primarily frustrated with persistent symptoms, pain control, difficulty returning to activity, and complications. For example, 1 user expressing dissatisfaction with the surgical outcome. She posted about having continued "excruciating pain" and that the surgery "did nothing." Another patient, an avid dancer, posted that surgery couldn't help "her body do what it loves" and that she did not know "how to work with (her) body" anymore. Several patients posted about complications,

including bowel/bladder incontinence and surgical site infection. Discussing postoperative pain control, setting the stage for realistic expectations regarding return to activities of daily living, and reviewing complications in-depth during the preoperative phase of care may help improve patient satisfaction rates with their microdiscectomy experience.

In this study, our findings show that the sex of the poster, whether patient or surgeon, had no influence on the tone of post.[16] Regarding phase of care, posts in the postoperative period were approximately 2 times more likely to express positive tone than posts in any other phase of care. These findings suggest there may be an overwhelming majority of patients expressing satisfaction with surgical outcome on social media, as patients tend to be more positive postoperatively with improvement in functional status.[17] Similar to patients undergoing anterior cruciate ligament reconstruction or hip arthroscopy, patients undergoing microdiscectomy focused primarily on return to activities of daily living (76.9%) and a return to sport (6.2%). References to the surgical incision site only encompassed 2.3% of posts, presumably due to the minimally invasive nature of the surgery and less visible location, compared with the 25% of anterior cruciate ligament and hip arthroscopy patients.[18] Additionally, we found that patients posting about lifestyle (daily activity, sport, and work) were 3 times more likely to have a positive tone than a nonpositive tone compared with when their posts depicted medical subject matter regarding the operation (article/poster/

Table 4. Univariate and multivariate subanalysis of patient posts with positive tone.[a]

Variable	Univariate OR (95% CI)	P Value	Multivariate OR (95% CI)	P Value
Male sex[b]	-	>0.05	-	>0.05
Postoperative[c]	3.69 (2.27, 6.01)	<0.0001	2.07 (1.17, 3.67)	0.013
Lifestyle[d]	4.31 (2.72, 6.81)	<0.0001	3.14 (1.85, 5.33)	<0.0001

[a]Positive tone vs nonpositive tone.
[b]Male vs female sex.
[c]Postoperative vs nonpostoperative.
[d]Lifestyle (daily activity, sport, and work) vs medical (article/poster/advertisement, imaging, incision, clinic scene, operating room scene, and medication).

Table 5. Univariate and multivariate subanalysis of spine surgeon posts with positive tone.[a]

Variable	Univariate OR (95% CI)	P Value	Multivariate OR (95% CI)	P Value
Male sex[b]	-	>0.05	-	>0.05
Postoperative[c]	8.97 (2.64, 30.48)	0.0004	5.27 (1.49, 18.70)	0.01
Lifestyle[d]	-	>0.05	-	>0.05

[a]Positive tone vs nonpositive tone.
[b]Male vs female sex.
[c]Postoperative vs nonpostoperative.
[d]Lifestyle (daily activity, sport, and work) vs medical (article/poster/advertisement, imaging, incision, clinic scene, OR scene, and medication).

advertisement, imaging, incision, clinic scene, operating room, and medication).

Surgeons posting on social media tend to focus on medical imaging (26.3%), such as postoperative x-ray images, and scenes of the operating room (34.9%), such as intraoperative photographs of the procedure. While surgeon content may serve as a marketing and educational tool for patients and other physicians, understanding that patients are posting more about returning to daily activities and their physical function—rather than their preoperative magnetic resonance imaging—may help to tailor the preoperative conversation.

This study has several limitations that should be considered. The primary limitation stems from the inherent nature of social media platforms, such as Instagram. Our study focused solely on publicly available content. Private profiles were not accessible and were not included in this study. This may have skewed our results to show an increased positivity, particularly if those postings on private accounts were more likely to share the negative outcomes or personal struggles of surgery compared with public profiles with a greater number of likes. As discussed, users with public accounts may purposefully add a positive tone or alter events to enhance their own personal image in an effort to gain more likes.[19,20] In addition to patients, spine surgeons are not exempt from self-promotion or ulterior motives. Nevertheless, those using social media are constantly exposed to these types of biases. It is the responsibility of the user to filter through these biases when making interpretations and drawing conclusions. Despite biases and potential tendency for self-idealization on social media, by analyzing a comparatively large number of posts (1500), we aimed to minimize this potential bias.

Our study was also limited in granularity of data that could be gleaned from content shared on social media. For example, the timing of posts (eg, immediate postoperative vs more than 1 week postoperative) was obtained from the date of the post and the associated caption, which often did not have specific references to the date of surgery but rather more general references. This may have affected our ability to determine how tone of post or patient satisfaction changes as a function of time. For example, patients further out from surgery would be expected to share more positive feelings or explicitly express satisfaction about their procedure, given that they are further along the path toward recovery. The limitations in the data prevented us from drawing such conclusions. Furthermore, our chosen social media platform, Instagram, may represent a different demographic makeup of users compared with other platforms, such as LinkedIn and Facebook.

Another limitation is that the final determination for tone of post and patient satisfaction was subjective to the reviewer. We attempted to account for subjectivity between the reviewers by having 1 male and 1 female reviewer who evaluated each post individually and discussed discrepancies in interpretation. Finally, our review of the patient's surgical and medical experience is limited by the content available in the text caption and image/media. Undoubtedly, having a more complete picture about each patient's medical history, diagnosis, and clinical course pre- and postoperatively would enhance the robustness and accuracy of our analysis.

CONCLUSION

The majority of content related to microdiscectomy surgery on Instagram is posted by patients, who generally share content with a positive tone and express feelings of satisfaction with their microdiscectomy surgical experience. Patients generally share content about returning to activities of daily living or sport, while surgeons emphasize medical imaging or scenes from the clinic and operating room. Overall, social media provides a unique and directionally informative tool for understanding the patient perspective. Moreover, it offers surgeons

and other medical professionals a novel opportunity to connect with and educate a wide audience, including patients and other medical professionals.

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Corresponding Author: Anastasios G. Roumeliotis, Department of Orthopaedic Surgery, Northwestern University Feinberg School of Medicine, 676 N Saint Clair St, Suite 1350, Chicago, IL 60611, USA; anastasios.roumeliotis@northwestern.edu