YouTube as a Source of Information on Neurosurgery

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BACKGROUND: **The importance of videos in social media communications in the context of health care and neurosurgery is becoming increasingly recognized. However, there has not yet been a systematic analysis of these neurosurgery-related communications. Accordingly, this study was aimed at characterizing the online video content pertaining to neurosurgery.**

METHODS: **Neurosurgery-related videos uploaded on YouTube were collected using a comprehensive search strategy. The following metrics were extracted for each video: number of views, likes, dislikes, comments, shares, date of upload, and geographic region of origin where specified. A quantitative and qualitative evaluation was performed on all videos included in the study.**

RESULTS: **A total of 713 nonduplicate videos met the inclusion criteria. The overall number of views for all videos was 90,545,164. Videos were most frequently uploaded in 2016 (n = 348), with a 200% increase in uploads compared with the previous year. Of the videos that were directly relevant to clinical neurosurgery, the most frequent video categories were "educational videos" (25%), followed by "surgical and procedure overview" (20%), "promotional videos" (17%), and "patient experience" (16%). The remainder of the videos consisted primarily of unrealistic simulations of cranial surgery for entertainment purposes (20%).**

CONCLUSIONS: **The findings from this study highlight the increasing use of video communications related to neurosurgery and show that institutions, neurosurgeons, and patients are using YouTube as an educational and promotional platform. As online communications continue to evolve, it will be important to harness this tool to advance patient-oriented communication and knowledge dissemination in neurosurgery.**

INTRODUCTION

The importance of social media communications in the context of health care is becoming increasingly recognized.[1] Videos are among the most powerful social media tools because they enable visualization of experiences and dialogues and also allow user-generated communications through comments. YouTube is the largest online platform for open access video content and has more than 1 billion users.[2] The Web site can be navigated in 76 different languages, making it the most widely used video-based social media platform.[3] For neurosurgery in particular, YouTube has arisen as an outlet to promote academic and hospital institutions and to enable neurosurgeons and health care professionals to disseminate appropriate patient education.[4] For example, the American Association of Neurological Surgeons and Journal of Neurosurgery Publishing Group have been some of the many organizations to use online videos as a tool to disseminate surgical education and enhance learning.[4]

Despite the increasing use and relevance of online videos pertaining to neurosurgery, to our knowledge, there has not yet been a systematic analysis of the online video content in this arena. This type of analysis is needed to ascertain the characteristics of such videos that attract users and how neurosurgeons and academics can harness social media to use it in the best way possible. To address this gap, the present study details the first comprehensive analysis of YouTube video content pertaining to neurosurgery and identifies several important themes emerging from the types of videos uploaded and viewed by the online neurosurgical community.

Key words
- Neurosurgery
- Online video content
- Social media
- YouTube

Abbreviations and Acronyms
IQR: Interquartile range

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METHODS

Search Strategy and Data Collection

A comprehensive YouTube search strategy was performed using the following terms: "neurosurgery," "neurological surgery," "neurosurgical," "brain surgery," OR "spine surgery."[4] As a result of the last search term, some videos were included because they pertained to spinal surgery but were also within the scope of orthopedic procedures. The search was conducted (by N.S.) in November and December 2016 and included videos uploaded on or before December 4, 2016. Data pertaining to the following metrics were extracted from each video: date of upload, number of views/likes/dislikes/comments, shares, and country or region of upload origin (where specified within the video content or in the video description).

Quantitative Analysis

Descriptive statistics that comprise mean, median, standard deviation, and interquartile range (IQR) for video metrics were calculated. All metrics were not normally distributed, which was also seen in previous studies on social media.[5,6] Therefore, we report our metrics using medians and IQR values. All calculations and figures were produced using Microsoft Office Excel 2007 (Microsoft Corporation, Redmond, Washington, USA).

Video Categorization and Qualitative Analysis

Videos were categorized according to their goal or purpose based on content within the video and title. After initial screening of most videos, common categories/themes that combine videos into qualitative themes were formulated. Axial and open coding was used to facilitate thematic analysis.[7,8] Open coding comprises identifying common grouping based on shared ideas within the videos assessed. Axial coding necessitates organization of information identified in the open codes into overarching themes. Videos were categorized first by one author (N.S.) and then followed by further review and verification from a second author (N.M.A.) during January–February 2017. Discrepancies between the 2 authors were resolved by discussion, and if needed, a third reviewer decided on the final category listed for the video.

Ethical Considerations

The cross-sectional data extraction methodology used in this study is in compliance with the Canadian Tri-Council Policy Statement for research that requires institutional ethics review. Data collected for this study were obtained from publicly available YouTube videos. There was no interaction or attempt to contact any YouTube users and user names were not identified or collected.

RESULTS

Quantitative Analysis

After removal of 16 duplicate videos, 713 unique uploads met the search criteria. A list of all 713 videos found in our search, with Uniform Resource Locators (URLs) and respective metrics, is provided in the **Online Supplementary Materials**. Descriptive statistics of all metrics on the 713 videos analyzed are summarized in **Tables 1** and **2**. The overall number of views for all videos was 90,545,164 (median, 1209; IQR, 161–24,553). The number of likes on all videos was higher than dislikes (1 million vs. 25,000). These videos were shared more than 100,000 times and received more than 40,000 comments. The region of origin was noted, where available, and users from the United States comprised the highest number of uploads by geographic region (17%). Videos that were categorized as "irrelevant to clinical neurosurgery" had the highest number of views (44,073,770), whereas videos detailing a "surgical and procedure overview" generated the highest number of shares (24,942) (**Table 2**). **Table 3** lists all uploads by country in our analysis. The upload timeline of these videos is provided in **Figure 1**, highlighting gradual increase in uploads over time, as well as temporal peaks in video uploads pertaining to neurosurgery.

Table 1. Video Metrics Among All Videos Included in Our Analysis

Video Metric	Total	Median (Interquartile Range)
Views	90,545,164	1209 (161–24,553)
Likes	1,045,965	8 (1–79)
Dislikes	25,931	0 (0–4)
Comments	148,579	11 (2–77)
Shares	43,206	5 (1–24)

Video Categorization and Thematic Analysis

A summary of the video categories found in our analysis and their respective frequencies is provided in **Figure 2**. The most frequent video category was "educational videos" ($n = 177$, 24.8%), with most of these videos containing educational content relevant to neurosurgical trainees ($n = 67$). These videos primarily pertained to details of surgical techniques, as well as principles of management of neurosurgical patients. For example, the most highly viewed video in this category (>86,000 views) was uploaded from the University of California, Los Angeles Health channel, and featured Dr. Neil Martin, showing "Unruptured aneurysms: when and how to treat." University of California, Los Angeles neurosurgery also contributed numerous educational videos for neurosurgical trainees within this category. Other highly viewed videos for trainees include details

Table 2. Cumulative Metrics by Video Category, Ranked by Highest Number of Views

Category	Views	Likes	Dislikes	Comments	Shares
Irrelevant to clinical neurosurgery	44,073,770	549,914	16,371	69,964	6605
Surgical and procedure overview	23,241,074	127,148	3984	29,146	24,942
Patient experience	20,979,639	358,636	5141	47,948	6262
Educational video	1,870,350	8674	362	1327	4743
Promotional video	356,825	1502	63	142	547
Other	24,618	91	10	52	41