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Spinal Cord Stimulation and YouTube: Content Analysis of Online Health Information

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Abstract

BACKGROUND/AIMS: Spinal cord stimulation (SCS) is a highly specialized and complex therapeutic method which uses an implanted device to personalize pain control. The main pur-pose of this study was to evaluate the quality, reliability, and sufficiency of the most viewed YouTube videos regarding SCS.

MATERIALS AND METHODS: This study provides a descriptive analysis of YouTube videos with the keywords "SCS", "SCS implantation", "SCS risks", or "SCS benefits". The Global Quality Score (GQS), the Journal of American Medical Association Benchmark Criteria (JAMA) and the Modified DISCERN Questionnaire (mDISCERN) scales were used to assess the videos' level of quality, reliability, and sufficiency.

RESULTS: A total of 63 videos were evaluated. The median score for GQS was 3 (1-5), while that for JAMA and mDISCERN was 2 (1-4) and 2 (0-5), respectively. While approxi-mately half of the videos (46%, n=29) were of poor-quality, the majority of the videos (65%, n=41) had partially adequate data. The video length and days posted for those videos with high-quality were significantly shorter than those for videos with either poor or intermediate quality ($p=0.03$, $p<0.001$).

CONCLUSION: YouTube offers easy access to medical information about SCS, however, videos about SCS were mostly partially inadequate and of moderate quality. Our results showed that YouTube is currently not a suitable online platform for patients. Patient information videos should only be created and disseminated by professional medical societies and monitoring standards are needed.

Keywords: Internet, online health information, social media, spinal cord stimulation, YouTube

INTRODUCTION

Spinal cord stimulation (SCS) is an emerging, minimally invasive intervention in the treatment of chronic neuropathic pain. SCS delivers electrical pulses directly to the spinal cord in order to inhibit the transmission of pain signals to the brain.[1] Each year, approximately 50,000 patients worldwide undergo SCS for indications such as failed back surgery syndrome, diabetic neuropathy, or complex regional pain syndrome, with varying degrees of success.[2,3] Being the most common neuromodulation therapy, its use has increased over the past decade and it is recommended in international clinical guidelines in Europe and the USA.[4,5] More recent technologies have now been developed, many of which avoid paresthesia.[6] SCS provides personalized pain control and optimization of its management at an individual patient level and therefore requires collaboration with the patient.

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The internet has revolutionized the world and resulted in innovative advances in the education and dissemination of medical information. It has become one of the most important sources of information for health issues with the capacity to rapidly sort through a huge amount of information. YouTube is a popular video site with over 1 billion users and over 5 billion visitors per day and it is considered to be an important medical information source today.[7] The ubiquity of YouTube has made it an educational resource for patients and a visual educational guide for medical professionals.

Among the interventional pain treatment approaches, SCS is a highly specialized and complex treatment modality which personalizes pain control with an implanted device, therefore, individuals can be unfamiliar with the benefits or complications of SCS. In general, patients may request information on SCS from their physicians, but previous research revealed that informed consent for surgical procedures, the critical component of interventional practice, is often incomplete.[8,9] Consequently, at least 74% of internet users search for medical information, which later influences their medical decision-making, with YouTube being one of the most popular platforms to access such information.[10,11] The internet can increase social support among patients, promote their sense of autonomy and individual decision-making, and also allow access to patient experiences and the views of other medical professionals. However, there is still no standard for quality control of medical content on online platforms. It is still a major problem that unregulated, low-quality, or inaccurate healthcare information is widely available.[12,13] Misleading or inappropriate information can put patients at risk and adversely affect their decision-making process.

In the practice of pain medicine, it is vital to provide clear visual guidance in order to define the complex interactions of anatomical structures, clinical skills, and medical knowledge. Several pain medicine organizations regularly produce comprehensive educational multimedia materials for advanced invasive interventions such as the SCS procedure. Recently, YouTube has become a potentially useful source of medical information for healthcare professionals, as they can easily access information about this complex condition relayed through a basic visual format. However, there is currently a risk that medical information on YouTube may be displayed in a way that is inaccurate, disorganized, or unfiltered.[12,13] Therefore, strategies should be implemented in order to evaluate and regulate YouTube videos.

Our primary aim was to evaluate the quality, reliability, and sufficiency of YouTube videos which patients and healthcare professionals encounter when using the internet for information regarding SCS. Our secondary aims were to evaluate the YouTube characteristics and production sources of SCS-related videos.

MATERIALS AND METHODS

1. Study Design and Ethics

This study provides a descriptive analysis of internet searches, without involving any experimental humans or animals. As a result, since the evaluated data were readily available to the public, this study did not need ethics committee permission.

We selected the search terms by using the Google Trends tool, which indicated the most popular search keywords by determining their search frequency related to the total worldwide traffic and by discussion among the authors of this study. After accessing YouTube with the Mozilla Firefox browser, we searched for the keywords "SCS", "dorsal column stimulation", "SCS implantation", "SCS risks", and "SCS benefits" using the private window settings. Private window mode provides users with an online privacy feature which disables the user's browsing history and the collection of individualized search results. Private window mode restricts the potential of encountering altered search algorithms. Relevance-based sequencing determined by internal YouTube algorithms was performed to sort the videos. The ranking of videos on YouTube may change due to changes in their number of views or their relevance. Therefore, the search results were compiled in a single session, on 01.09.2022. Since our aim was not to evaluate all videos, but only those most likely to be clicked on by internet users, we performed our evaluation on the top 50 videos alone. The exclusion criteria were; non-English videos, unrelated videos, and advertisements. Duplicate or inaccessible videos were also eliminated. The inclusion criteria were; mainly SCS-related content, English language, and real patients' experiences. In the final assessment, the videos were categorized into four groups; videos created by health care professionals, medical organizations or associations were classified as "*medical*", videos edited by public associations or media organizations were classified as "*non-medical*", and also videos were classified as being of "*patient origin*" or "*SCS device manufacturer origin*".

2. Video Characteristics

The following parameters of the videos included were evaluated; country of origin, total viewership, number of likes and dislikes, number of comments, days since being posted, and the length of the video (seconds). Also, their view ratio (the number of views/number of days x100%), and the video interaction index (number of likes & dislikes x the number of views/100%) were calculated from the metadata of the videos.

3. Video Assessment

The top 50 videos for each term were assessed by the one of the authors, and the links were shared with the three investigators who rated the videos. Three pain specialists were selected as the assessor team. If there was a major differences in the ratings between the assessors, consensus was made to reach a final decision. If uncertainties about the videos could not be resolved, a voting method was performed to obtain a score for those videos. The following tools were used to determine the reliability, accuracy and quality of the video-based information on SCS; the Global Quality Score (GQS) and Journal of the American Medical Association (JAMA) Benchmark Criteria, and the Modified DISCERN Questionnaire.

3.1. Global Quality Score

The GQS instrument with a scale of 1 to 5 was used to assess the videos' content quality, including the flow of the videos and the accuracy of their content. The information was categorized in the GQS as follows: it is of poor-quality with a poor flow, and has the majority of information missing, making it useless to patients (1); it is generally poor, has some information provided but very limited usefulness for patients (2); it is of moderate-quality and discusses some important information adequately (3); it is of good-quality and has most of the information listed, and so is useful for patients (4); or it is of excellent-quality and has very good flow, making it very useful (5). Information with a higher GQS is of higher-quality. Bernard et al.[14] created this scale to assess how easily accessible and logically organized information on websites is.

3.2. JAMA Benchmark Criteria

The reliability and accuracy of videos and resources were evaluated using the JAMA, a 4-point tool. Their authorship, attribution, disclosure, and currency are the four classifications.[15] Each video was evaluated by an examiner, who assigned one score for each category.

3.3. Modified DISCERN Questionnaire

There are five *yes/no* questions on the Modified DISCERN Questionnaire's score scale. These questions look at the features of the resources in order to assess their quality. The overall score was determined by adding the "*yes*" scores, which are worth one point per score and so there is a possible range from 0 to 5, with 5 being the highest resource quality.[16,17]

Statistical Analysis

SPSS 16.0 Statistical package program (SPSS, Chicago, IL, USA) was used for statistical analysis. Quantitative variables were tested for normality using the Shapiro-Wilk test. Descriptive data were presented as numbers (n), frequencies (%), medians, minimums and maximums. Non-parametric data was compared using Kruskal-Wallis with post-hoc Bonferroni correction for multiple comparisons. Spearman correlation was performed in order to assess any association of the video assessment scores (GQS, JAMA and Modified DISCERN) with the video parameters. A p-value <0.05 was considered to be statistically significant.

RESULTS

A total of 63 videos were analyzed. The flowchart for the video selection is demonstrated in Figure 1. Most of the videos were posted from the US (87.3%, n=55), and the video uploaders were mainly professional health organizations (46.03%, n=29). Table 1 shows the descriptive information regarding the videos.

The median scores for GQS, JAMA and Modified DISCERN Questionnaire (mDISCERN) were 3 (1-5), 2 (1-4) and 2 (0-5), respectively. Based on the GQS, 21 of 63 videos were classified as being of high-quality, while approximately half of the videos (29/63) were categorized as poor-quality. The majority of the videos (65.1%, n=41) had only partially adequate data (i.e., 2 or 3 points on the JAMA scale). Table 2 shows the assessment of the medical content.

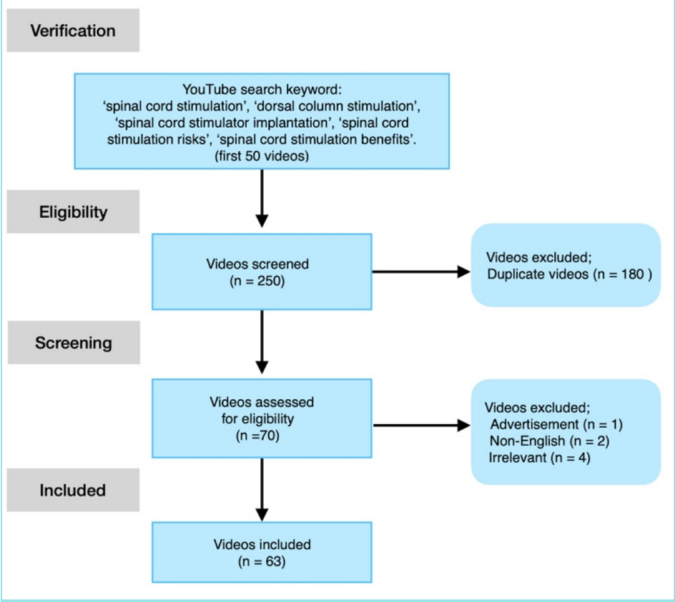

Figure 1. Flow chart of the selection of the videos.

According to a comparison of video quality with the GQS, the video length for those videos with high content quality was significantly shorter than for those videos with either poor content quality or moderate content quality, (p=0.03). Additionally, high content quality videos had been posted more recently to the network than those videos with either poor or moderate content quality (p<0.001). Comparisons of the assessment scores based on the GQS are shown in Table 3.

Table 1. Descriptives of the YouTube videos regarding SCS

	Total (n=63)
Country of origin	
U.S.A.	55 (87.3%)
U.K.	3 (4.7%)
Canada	3 (4.7%)
India	2 (3.1%)
Number of views	7,683 (277-372,713)
Length of video (seconds)	249 (77-2,976)
Likes	41 (0-1,714)
Dislikes	3 (0-119)
Comments	0 (0-1,418)
Days since being posted	987 (54-4,922)
Viewing numbers	8.21 (0.08-362.4)
Interaction index	0.63 (0-5.44)
GQS	3 (1-5)
JAMA	2 (1-4)
mDISCERN	2 (0-5)

Data are presented as number (%) or median (minimum-maximum). SCS: Spinal cord stimulation, U.S.A.: United States of America, U.K.: United Kingdom, GQS: Global Quality Score, JAMA: Journal of American Medical Association Benchmark Criteria, mDISCERN: Modified DISCERN Questionnaire.

Table 2. Assessment of medical content

GQS	
Poor-quality (1-2 points)	29 (46)
Moderate-quality (3 points)	13 (20.6)
High-quality (4-5 points)	21 (33.3)
JAMA	
Inadequate data (1 point)	20 (31.7)
Partially adequate data (2-3 points)	41 (65.1)
Completely adequate data (4 points)	2 (3.2)
mDISCERN	
0	4 (6.3)
1	10 (15.9)
2	20 (31.7)
3	17 (27)
4	10 (15.9)
5	2 (3.2)

Data are presented as number (%). GQS: Global Quality Score, JAMA: Journal of American Medical Association Benchmark Criteria, mDISCERN: Modified DISCERN Questionnaire.

When comparing the videos in terms of their sources, the median GQS, JAMA and mDISCERN scores of those videos uploaded by medical organizations were higher than those videos uploaded by patients or non-medical media organizations ($p<0.001$). The GQS, JAMA, and DISCERN scores for videos uploaded by either patients or non-medical organizations were found to be lower than those uploaded by SCS device manufacturers ($p<0.001$). The video lengths for those videos uploaded by medical organizations or health care professionals were significantly longer compared to those of non-medical organizations ($p=0.028$) (Table 4).

A significant negative correlation was present between the number of days since being posted and the content quality. Those videos with high-quality had been uploaded more recently than those with poor or moderate content quality ($r=-0.654$; $p<0.001$) (Table 5).

DISCUSSION

In this study, we assessed the accuracy, reliability and quality of the most popular YouTube videos providing information about SCS. According to GQS, approximately half of the videos were in the poor-quality group, and most videos had partially adequate data based on their JAMA scores. Additionally, in terms of GQS, videos in the high content quality group were associated with shorter video length, fewer days since uploading, higher JAMA and mDISCERN scores. Our results also demonstrated that the quality, accuracy, and reliability of those videos created by patients were lower than those uploaded by either medical organizations, health care professionals, or SCS device manufacturers.

YouTube is the most widely used video hosting platform, as well as the second most clicked on site globally.[18] Although YouTube was not created for the dissemination of online health information or medical education, the internet revolution has had an impact on online health platforms, making it one of the most popular sources of health data. Currently, video-based learning has become one of the most important learning methods. Recently, several studies have reported on the benefits of video-based learning in the learning process, particularly in increasing the understanding of information.[19-21] Other advantages of video-based learning are that it takes less time, it is easily accessible at any time, and it has reusable resources. Moreover, studies indicate that online written content provided by professional organizations and medical health information websites exceed the health-literacy policies recommended by guidelines.[22] Unlike written-format information, YouTube videos have the advantages of translating complex medical terminology into simpler terms, allowing audiences to easily understand the subject. However, there is no peer-review process or quality control standard for YouTube videos, giving the public access to unfiltered, often inaccurate information, which can adversely affect

Table 3. Parameters of YouTube™ videos regarding Global Quality Score

Factor	Poor-quality	Moderate-quality	High-quality	p[a]
Number of views	7,683 (277-199,959)	11,137 (775-372,713)	3,721 (310-117,095)	0.146
Days since being uploaded	1,436 (200-4,922)	1,460 (203-3,792)	478 (54-1,001)[c,d]	<0.001
Length of video (seconds)	210 (77-2,766)	292 (106-2,309)	384 (143-2,976)[c,d]	0.03
Number of comments	3 (0-1,418)	0 (0-469)	0 (0-340)	0.098
Interaction index	0.607 (0-5.44)	0.69 (0.02-1.94)	0.859 (0-1.85)	0.871
Viewing rate	6.576 (0.08-139.25)	10.015 (3.82-362.4)	9 (0.6-99.32)	0.126
JAMA score	1 (1-3)	2 (2-3)[b]	3 (2-4)[c]	<0.001
mDISCERN score	2 (0-2)	3 (2-3)[b]	4 (2-5)[c]	<0.001

Data are presented as median (minimum-maximum). Note that Bonferroni adjustment was done. [a]Kruskal-Wallis test was performed. [b]Pairwise comparison between poor-quality and moderate quality videos. [c]Pairwise comparison between poor-quality and high-quality videos. [d]Pairwise comparison between moderate-quality and high-quality videos (adjusted p-values <0.05 for pairwise comparisons between groups). JAMA: Journal of American Medical Association Benchmark Criteria, mDISCERN: Modified DISCERN Questionnaire.

Table 4. Comparison of parameters according to the source of the YouTube videos

Factor	Medical	Non-medical media organization	Patient	Manufacturer	p[a]
Number of views	11,137 (310-372,713)	7,683 (713-110,045)	9,273 (3,530-86,637)	3,698 (277-254,407)	0.087
Length of the video (seconds)	377 (146-2,766)[b]	180 (77-244)	417 (93-2,976)	248 (94-1140)	0.028
Days since being uploaded	1,436 (72-3,792)	1,042 (200-2,001)	1,181 (595-4,922)	702 (54-3,665)	0.093
Interaction index	0.55 (0-1.67)	0.773 (0.2-3.23)	0.685 (0.06-5.44)	0.637 (0-1.85)	0.372
Viewing rate	10.01 (0.44-199.38)	4.87 (1.36-79.28)	7.75 (0.72-52.25)	8.69 (0.08-362.4)	0.285
GQS	3 (1-5)[b,c]	2 (1-3)	2 (1-2)	3 (1-4)[f,g]	<0.001
JAMA	3 (1-4)[b,c]	1 (1-2)	1 (1-2)	3 (1-3)[f,g]	<0.001
mDISCERN	3 (1-5)[b,c]	2 (0-2)	1 (0-2)	3 (1-4)[f,g]	<0.001

Data are presented as median (minimum-maximum). Note that Bonferroni adjustment was performed. [a]Kruskal-Wallis test was performed. [b]Pairwise comparison between medical vs. non-medical media organization videos. [c]Pairwise comparison between medical vs. patient videos. [d]Pairwise comparison between the medical vs. manufacturer videos. [e]Pairwise comparison between the non-medical media organization vs. patient videos. [f]Pairwise comparison between the non-medical media organization vs. manufacturer. [g]Pairwise comparison between the patient vs. manufacturer (adjusted p-values <0.05 for pairwise comparisons between groups). GQS: Global Quality Score, JAMA: Journal of American Medical Association Benchmark Criteria, mDISCERN: Modified DISCERN Questionnaire.

the perceptions and decision-making processes of the patients and their families. Moreover, video-sharing platforms including YouTube have positioned themselves as an important way to access up-to-date medical information for healthcare professionals. Therefore, it might be beneficial for medical professionals to read research regarding these videos and learn about the parameters of their quality. Therefore, we aimed to evaluate YouTube's current SCS content in this study.

According to the results of this study, patients and healthcare professionals may face difficulties in accessing trustworthy and useful information regarding SCS presented on YouTube. According to the GQS, only about one-third of the videos had high-quality, and only two of the videos fulfilled all JAMA criteria for assessing quality and reliability. Supportively, many previous studies evaluating medical information regarding topics such as vaccinations, deep brain stimulation and disc herniation, reported YouTube videos to be of low-quality and reliability.[23-25] As one of the core aspects of interventional pain procedure training is visual in nature, the use of videos for pain medicine practice can be crucially beneficial for trainees. How to produce reliable and high-quality visual materials and incorporate them into pain medicine practice is in itself an important topic for pain medicine. Therefore, high accuracy and quality videos produced for use in pain medicine practice require extensive planning and careful execution.

One of the most striking points in this process of reviewing YouTube videos was the inadequate performance of the video content in reporting the complications and risks of SCS. It is important to provide accurate and unbiased information to patients scheduled for SCS during their decision-making process. In this process, when discussing the significance of SCS, its benefits and the rationale for its use are prioritized in most videos, however, the risks of this procedure and the life modifications after SCS implantation, although rare, were less shared. Indeed, SCS is a highly specialized and complex treatment modality which personalizes pain control with an implanted device, and individuals may not be adequately informed about its benefits, complications or outcomes. Newer technologies have now been produced, many of which are paresthesia-free.[26] Given that paresthesia can cause some discomfort, especially with positional changes and in a variety of activities, paresthesia-free SCS could be an option for patients.[27] Thus, patients who are candidates for SCS go looking for information regarding SCS, and the internet is the easiest way to access this knowledge. The mDISCERN subscale of "uncertainty" and GQS assessing video content could be valuable items for patients researching information for their decision-making process. It is important to provide patients with reliable and clear information about the various aspects of SCS, such as the trial and implantation phases, its complications and risks, the variable degrees of success in different neuropathic pain syndromes, and its mechanism of action. Unbiased videos can assist patients to distinguish well-known facts from unproven and unclear areas.

Of the 63 videos included in our study, 12 (19%) were "*patient*" videos, which are real patient experiences or opinions about SCS. This finding indicates that patients use the internet not only to research health information, but also to disseminate medical information. In general, patient experiences may provide beneficial information for prospective patients seeking real-life opinions about SCS. However, the perspective of patients who have undergone SCS could be significantly biased and adversely affect the perceptions of prospective patients and this can lead to the spread of unfiltered, often inaccurate information. Our study found that the quality, accuracy, and reliability of videos produced by patients were lower than that of videos produced by SCS device manufacturers and medical organizations. This finding is consistent with a wealth of literature indicating that the source of videos is related to its content quality. The quality of videos shared by non-medical users was lower than those of professional healthcare uploaders or medical organizations.[28-30] Our results suggest that before viewing a video about SCS, one should consider the source of the video. Online health information videos should only be produced and posted by reputable professional societies and qualified specialists in order to avoid the spread of unregulated low-quality or inappropriate information. Furthermore, the patients' capability to understand medical information will be affected by their level of health literacy and the complexity of the terminology used. Although this subject may appear contradictory, meeting certain standards and providing complex information in a direct manner by expert authors will allow the general public to receive reliable medical information.

Table 5. Correlations between parameters and assessment scores of the YouTube videos about SCS

Factor	GQS score	JAMA score	mDISCERN score
View number	r=-0.114	r=-0.174	r=-0.039
Days since being uploaded	r=-0.654; p<0.001	r=-0.447; p<0.001	r=-0.471; p<0.001
Length of the video (seconds)	r_s=0.309; p<0.014	r_s=0.254; p=0.045	r_s=0.295; p=0.019
Number of comments	r=0.125	r=0.035	r=0.043
Interaction index	r=0.147	r=-0.017	r=0.014
Viewing rate	r=0.169	r=0.181	r=0.171
GQS	-	r=0.812; p<0.001	r=0.883; p<0.001
JAMA	r=0.812; p<0.001	-	r=0.716; p<0.001
mDISCERN	r=0.883; p<0.001	r=0.716; p<0.001	-

P: Results of Spearman rank correlation (r_s) test. GQS: Global Quality Score, JAMA: Journal of American Medical Association Benchmark Criteria, mDISCERN: Modified DISCERN Questionnaire.

After categorizing videos according to the GQS as poor, moderate or high-quality, we found that high content quality videos had longer durations. This finding was mainly secondary to the fact that longer videos had the potential to be better organized with a clearer plan and that a longer video durations provided the opportunity to deliver more rounded evaluations of SCS. A negative association was present between the quality of the videos and the number of days since its uploading, namely, videos with high content quality had been uploaded more recently. However, there were no differences in the interaction index or viewing rates between videos of different levels of quality, which is of great concern. Similar findings were reached in previous studies, namely that the number of likes, dislikes or views was not a prognostic factor for identifying high-quality videos.[31,32] These results indicate that patients are unlikely to understand the quality of information presented on YouTube and that low-quality content videos containing misleading information are watched as often as high-quality videos.

Study Limitations

This study had a few limitations. Firstly, the evaluation was completed on a single day, but YouTube is a dynamic platform, so the parameters of videos may vary over time. Secondly, only videos in English were included. However, English is a global language, and English-language information may be accessed from anywhere in the world. Finally, since there are other online platforms besides YouTube that patients can use to research information, further studies assessing and comparing these platforms should be planned.

CONCLUSION

The results of this present study demonstrated that videos about SCS on YouTube mostly contained partially sufficient data and about half of the videos had poor content quality. Also, according to our results, the reliability, accuracy and quality scores of those videos published by medical organizations were higher than those uploaded by patients or non-medical media organizations. Finally, we believe that the results of this present study will draw attention to the lack of trustworthy information on SCS and motivate professional societies to improve the quality of online health information. Effective and comprehensible information retrieval may improve perceptions among the public towards SCS.

MAIN POINTS

- With its ability to quickly search through a vast amount of information, the internet has become as one of the most significant sources of information for health-related issues.
- SCS is one of the interventional pain treatment methods which personalizes pain control with an implanted device; as such, people may not be familiar with the advantages or disadvantages of SCS.
- The Internet can allow patients to feel more supported by their social networks, encourage their sense of independence and their ability to make their own decisions, and give them access to other patients' experiences and the opinions of other medical professionals.
- The results of this present study will draw attention to the lack of reliable information about SCS on YouTube, and motivate professional societies to improve the quality of online health information.

ETHICS

Ethics Committee Approval: As a result, since the evaluated data were readily available to the public, this study did not need ethics committee permission.

Informed Consent: It wasn't obtained.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: H.C.K., S.T., Ö.T.A., Design: H.C.K., S.T., Ö.T., Ö.T.A., Data Collection and/or Processing: S.G.K., H.C.K., Ö.T., Ö.T.A., Analysis and/or Interpretation: H.C.K., S.T., Literature Search: S.G.K., H.C.K., Ö.T., Writing: S.G.K., H.C.K., F.Ç.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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