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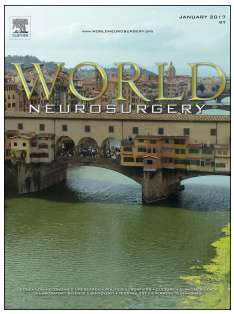

YouTube as a Source of Patient Information for Hydrocephalus: A Content-Quality and Optimization Analysis

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Title: **YouTube as a Source of Patient Information for Hydrocephalus: A Content-Quality and Optimization Analysis**

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Abstract.

Objective: YouTube is currently the second most popular website in the world and thus it is often used by patients to access health information regarding their condition(s). Our aim was to evaluate the content-quality of YouTube videos relating to hydrocephalus.

Methods: We chose the first 35 videos for four different search phrases: ”water on the brain,” ”hydrocephalus,” ”pediatric hydrocephalus” and ”adult hydrocephalus.” Video contents were evaluated by two independent final year medical students with more than 5 years of experience using the DISCERN criteria (scoring system from 1-5 per question). Qualitative data, quantitative data and the upload source about each video was recorded for quality and optimization analysis.

Results: Out of the total 140 videos, 63 videos met our inclusion criteria and were evaluated. The mean DISCERN score was 29.9 out of a total of 75 possible points. This indicates that the quality of YouTube videos on hydrocephalus is currently poor. Reliability between the two raters was excellent (intraclass correlation coefficient = 0.96). Most videos had clear information (90%), a doctor speaking (70%), and described the symptoms (62%). Videos were most commonly uploaded by hospitals (44%) or by educational channels (43%). Our study found that videos that contained the results of treatment had a much higher average daily view (P=0.0229) than videos that did not.

Conclusion: The quality of YouTube videos on hydrocephalus is poor, however, we indicated the top-quality videos in our paper as they may be effective tools for patient education. Our

optimization analysis found that including diagrams and explaining the results of hydrocephalus treatment results in a higher audience engagement (in the form of likes, comments and views).

1.0 Introduction:

With an estimated 58.8% of the world having access to internet in 2019, the use of internet as a source of both general and specific information has grown exponentially over the last decade[1]. Due to the internet's accessibility, major assets and ease of use, it has developed to be a major learning platform for doctors, residents, medical students, patients and relatives for acquiring medical knowledge[2,3]. Video-sharing sites have proven to be a popular source for both entertainment and educational information[4]. YouTube is the biggest video-sharing site with over 1.9 billion logged-in users monthly, and contains a growing library of health-education videos[5]. With such a large user base, there have also been raised concerns about the accuracy and reliability of the available health care related information. Since YouTube is ranked as the second to third most accessed website worldwide, the probability of disseminating misleading information to healthcare consumers is high and can have catastrophic implications[4,6]. However, if guided search practices are followed, YouTube can be used as an effective informative resource. Therefore, it is important to test and evaluate the information presented on this platform properly.

The accuracy of patient education videos on YouTube has been investigated for some neurological conditions and treatments, including disc herniation, lumbar discectomy, glioblastoma treatment and neurosurgery videos in general[7–10]. To date, however, no paper has yet evaluated the quality and content of videos on YouTube regarding hydrocephalus. Hydrocephalus is a central nervous system disorder characterized by excessive accumulation of cerebrospinal fluid (CSF) within the head, caused by the disturbance of flow, absorption, or more rarely excessive formation. Although hydrocephalus is more commonly seen in the

pediatric population, it can affect any age, and result in significant cognitive and physical handicap[11–14]. Due to its increasing popularity as an educational platform and high online traffic, our study investigates the information available specifically on YouTube.com regarding hydrocephalus. Unlike journal articles or textbooks that are heavily reviewed, there is no review process for the videos being uploaded on YouTube. This results in a variable reliability of content quality yet millions worldwide still use this platform for health education[15]. For this reason, research to establish the accuracy and reliability of these educational videos is crucial. Our aim was to evaluate videos on YouTube regarding hydrocephalus and find what features drive audience engagement with a video. We also sought to help patients, medical staff and people wanting to learn about this disorder obtain the best possible information available on YouTube by finding the best resources.

2.0 Materials and Methods:

2.1. Search strategy and data collection

So that no personal recommendations affected the search results, Google Chrome was used in "incognito mode" when browsing YouTube to collect the videos for analyze. Moreover, we were not logged in to any personal Google or YouTube account. Searches were made with the default "relevance" sorting. The first 35 results from the search phrases: "Water on the brain," "Hydrocephalus," "Pediatric hydrocephalus" and "Adult hydrocephalus" were extracted for analysis. Only the first 35 results were collected since 90% of YouTube users do not view past

the 30th video[16]. In this study we accepted 5 more videos for an even more robust sampling. Collection of all videos were conducted on October 28, 2019. Video contents were evaluated by two independent final year medical students with more than 5 years of experience using the DISCERN criteria.

2.2. Inclusion and exclusion criteria

To choose videos that were relevant to hydrocephalus, we excluded those that were (1) completely irrelevant (e.g. music videos), (2) too long for the average viewer to watch (>1 hour), (3) videos not in English and (4) blatant advertisements.

2.3. Variables extracted

Videos were quantitatively assessed by using the "vidIQ Vision for YouTube" Google Chrome extension as it offers extra statistics that are not seen on a standard YouTube page. For each video a like ratio [(likes/likes +dislikes)*100] and Video Power Index (VPI) [(like*100/(like + dislike))*(views/day)/100] was calculated to assess audience video engagement.

We recorded if a video included the following qualitative data: clear information, symptoms of hydrocephalus, risk factors during surgery and how to do the procedure, results of treatment, prognosis, animations, radiological images, diagrams, if the normal CSF circulation and anatomy of the ventricular system were explained, different causes of hydrocephalus, and whether it was a patient experience or doctor speaking. We categorized the upload source for each video into: physician, hospital, educational channel, patient or miscellaneous (when identifying data could not be found or determined).

We recorded the following quantitative data: view count, comments, likes, dislikes, video referrers, duration (seconds), the video description word count, the video description link count, the upload date, the channel subscribers, the channel mean daily views and the channel mean daily subscribers.

2.4. Scoring system

(Table 1)

The videos were evaluated independently by two final year medical students using the DISCERN Instrument as seen on Table 1. The DISCERN instrument is made for the intent of assessing the quality and reliability of publications concerning treatment choices. The scoring system is based on assessing 16 questions with the rated scale from 1 to 5. With the score of 1 the quality criteria are unfulfilled, and with the score of 5 they are entirely fulfilled[17]. Videos with an overall average DISCERN score of 2 or below indicates «poor» quality, serious shortcomings, and is not a useful or appropriate source of information regarding treatment choices. It is unlikely to be of any benefit and should not be used. A moderate score of 3 is considered to be of “fair” quality. It is to some extent a useful source of information regarding treatment choices, but additional information or support should definitely be acquired. A higher score of 4 or above is considered a “good” quality source and is an appropriate and useful source of information regarding treatment choices[17].

The DISCERN score may also be interpreted based on the total number of points were the minimum score is 15 and maximum score is 75. A score ranging from 63 to 75 points are

denoted as excellent. 51 to 62 points denoted as good, 39 to 50 points denoted as fair, 27 to 38 points denoted as poor, and 16 to 26 points denoted as very poor[18].

2.5 Video Optimization

To find out exactly what video content drove audience engagement we grouped the videos based on their qualitative video content (such as if the video included the risk factors of surgery) and then analyzed them against their average daily views, like ratio, VPI, video duration, number of comments and DISCERN score. Significant statistical relationships were recorded.

2.6 Statistical methods

Standard statistical methods were used for all calculations. Descriptive statistics for continuous variables covered mean, median, range and standard deviation. The Mann–Whitney U test was used to find differences between categorical variables and the intraclass correlation coefficient was used to ascertain inter-rater agreement. A p value below 0.05 was deemed significant. Google Sheets (Google LLC, Mountain View, CA, USA), MedCalc version 19.1.3 (MedCalc Software, Acacialaan 22, 8400 Ostend, Belgium) and Past (Hammer and Harper, Øyvind Hammer, Natural History Museum, University of Oslo) were used for statistical analysis and illustrations. We have provided the xls electronic supplementary document online for all our raw data[19,20].

3.0 Results:

3.1 Video Contents:

63 videos were evaluated. Figure 1 illustrates the qualitative aspects of the video content on Hydrocephalus. Most of the videos 90% (57 videos) provided clear information to the viewer, 70% (44 videos) had a doctor speaking, 62% (39 videos) talked about the possible symptoms present when having hydrocephalus and 54% (34 videos) talked about the results expected from treatment. In contrast, very few of the videos 16% (10 videos) explained the CSF circulation, 10% (6 videos) explained the ventricular anatomy and only 10% (6 videos) showed diagrams to augment the narrative explanation.

(Figure 1)

3.2 Video Upload Source:

Figure 2 illustrates the source of the videos uploaded. Most of the videos were uploaded either by a hospital 44% (28 videos) or by an educational channel 43% (27 videos). Hardly any videos were uploaded by a physician 5% (3 videos) or a patient 2% (1 video).

(Figure 2)

3.3 Video Statistics:

The following are the mean and range for all the quantitative video metrics for all the videos analyzed: the view count 20,041 (39–351,600), number of comments 11 (0–126), number of likes 102 (0–2,000) number of dislikes 5 (0–76), view rate per day 8,041 (34–71,500), the like ratio 94.8 (66.7–100), the video referrers 15 (0–187), duration 737.9s (27–3,565s), the video

description word count 64 (0–479), the video description link count 1 (0–8) and days since upload 1,327 (93–3,432).

The following measure the overall *channel* popularity of the videos: the mean channel subscribers were 19,446 (110–177,000), the channel mean daily views were 8,041 (34–71,500) and the channel mean daily subscribers were 40 (0–300).

3.4 Video Quality Evaluation:

The individual raters had a DISCERN score of 30.2 ± 8.2 (19–62) and 29.5 ± 8.9 (18–67) respectively. The mean DISCERN score between the raters was 29.9 ± 8.6 (18–67). The intraclass correlation coefficient for the absolute agreement was 0.96 between the two students as shown on Table 2; this is regarded as an excellent reliability[21,22]. The DISCERN scoring between the two raters is shown on Figure 3.

(Table 2)

(Figure 3)

The mean score of question 16 of DISCERN – which requires a holistic judgement of the entire video – was 2.25 (1–5) and 1.77 (1–5) respectively.

Figure 4 illustrates the mean score between both raters for each of the 16 DISCERN instrument questions. It shows that question 1, question, 2 and question 3 had the *highest* scores overall. These questions respectively ask if the aims are clear, if it achieves its aims and if it is relevant. Figure 4 shows that question 4, question 5, and question 6 had the *lowest* scores overall. These

questions respectively deal with if the sources of information were presented, if those sources were given a publication date and if the overall message of the video was balanced and unbiased.

(Figure 4)

3.5 Video Quality:

Videos which included the following qualitative information all had a statistically significant higher DISCERN score than those that did not: clear information (P=0.0350), animation (P=0.0398), radiological images (P=0.0052), diagrams (P=0.0011), the symptoms of hydrocephalus (P=0.0387), the results of treatment (P=0.0109), the risk factors during surgery (P<0.0001), the prognosis (P=0.0012). the surgical procedure (P<0.0001), the physiology of CSF circulation (P=0.0387).

(Table 3)

3.6 Audience Engagement:

Videos that included the results of treatment (P=0.0007) had a higher VPI, a higher average daily view rate (P=0.0229) and a higher number of comments (P=0.0360). Videos that included diagrams (P=0.0398) had a higher like ratio.

Videos that contained symptoms of hydrocephalus (P=0.009), risk factors during surgery (P = 0,0001), steps on how to do the procedure (P=0.0013), radiological images (P=0.0203), diagrams (P=0.0111), explanation of normal CSF circulation (P=0.0252) and an explanation of

the anatomy of the ventricular system (P=0.0081) all had a longer duration than those who did not.

3.7 Most popular videos:

(Table 4)

In our study, 16 out of 63 videos on YouTube (25.4%) came from the 5 YouTube channels mentioned in Table 4, showing the most popular hydrocephalus videos based on the VPI criteria. 1 out of the 63 videos (1.6%) were uploaded by *Boston Children's Hospital* and had a VPI of 1.064, which was the best score for all the videos rated. 1 out of the 63 videos (1.6%) were uploaded by *Neuroscientifically Challenged* and had a VPI of 0.550. 7 out of 63 videos (11.1%) were uploaded by *Hydrocephalus Association* and had a mean VPI of 0.104 ((sum of VPI of video 1 to 7) / 7). 6 out of the 63 videos (9.5%) were uploaded by *Carilion Clinic* and had a VPI of 0.144.

3.8 Top quality videos:

(Table 5)

In our study, 7 Out of 63 videos on YouTube (11.1%) came from the 5 YouTube channels mentioned in table 5, showing the top-rated hydrocephalus videos based on the DISCERN criteria. 2 out of the 63 videos (4.7%) were uploaded by *UW Medicine Neurosciences Institute* and had a mean DISCERN score of 32 ±15.5 indicating an overall poor quality ((mean DISCERN

score of video 1 + video 2) / 2). 2 out of the 63 videos (4.7%) were uploaded by *Memorial Hermann* and had a mean DISCERN score of 43.5 ± 6.36 indicating an overall fair quality.

4.0 Discussion:

4.1 Quality analysis:

We found that the overall video quality and accuracy of hydrocephalus videos were poor[18] with a mean DISCERN score of 29.9 ± 8.6 (18–67). This shows that patients searching on YouTube concerning hydrocephalus are not getting the most holistic information at the moment. Many videos did not contain diagrams, CSF physiology, or ventricular anatomy, which were all factors that would have generated a better video according to our analysis. Nearly all videos were biased, did not provide a production date, and most importantly did not provide additional sources of information reinforcing what was discussed in the video. These flaws contributed to a lower DISCERN score and uncertainty of the validity of the information. However, most videos had clear information, achieved its aims and were relevant; these features caused a higher DISCERN score. The findings of our paper are novel as so far, the quality and in-depth analysis of YouTube videos on hydrocephalus has not been yet evaluated.

As shown in earlier studies, the use of internet for searching information regarding hydrocephalus is common[3]. 81.9% of caregivers of children with hydrocephalus used it as a source of information. In referred studies YouTube was preferred for personal and

hydrocephalus-related uses. This indicates the importance of evaluating the information found on YouTube related to hydrocephalus.

All of the videos with the highest VPI (the videos most popular among viewers) had a DISCERN score of poor or very poor quality. This indicates that the most viewed videos regarding hydrocephalus are of poor educational value and often misleading; this reflects the problem of YouTube as a source of medical information. These videos should therefore only be viewed for their entertainment value and not for instructive purposes. Our findings are similar to other YouTube evaluation studies, showing that what engages the viewer is most often not videos of highest quality[23]. The videos that had the highest VPI could be interpreted as more entertaining but at the same time lack vital information (i.e. treatment options). The videos scoring a higher DISCERN score came from health-related institutions and could to some extent be an "information overload" for the average viewer. This could be a good reference point for future making of videos, trying to combine those aspects which are of most concern when trying to assemble the most informative as well as the most entertaining videos on the subject of hydrocephalus.

In our paper, we have indicated the highest quality and most informative videos so that physicians can suggest these particular videos to their patients with confidence. The two highest DISCERN scoring videos contained all features analyzed except for a patient experience. The rest of the top videos all included following features: clear information, symptoms of hydrocephalus, risk factors during surgery, results of treatment, radiological findings. Notably, 3 out of 5 of these were over 45 minutes, however, all of them contained high quality

information about hydrocephalus. Out of the 63 videos, 7 came from 5 channels that had 5 of the highest DISCERN scoring videos. All of these channels were by hospitals, and this may explain the higher quality of videos.

We have highlighted the most common information gaps that most YouTube videos on hydrocephalus presents with, so that for the future, hospitals and educational channels — which together represent 87% of the most commonly viewed video uploads for hydrocephalus— can create overall better content.

4.2 Optimization findings:

Our study's optimization analysis showed that including the results of treatment and including diagrams significantly drove audience engagement. Videos explaining the result of a treatment had a significantly increased average daily video views, comments and VPI. Videos that contained diagrams had in a higher like ratio. Diagrams in particular may help viewers understand ventricular blockage in hydrocephalus and thus we recommend these suggestions to future video creators. With these two recommendations, producers of videos concerning hydrocephalus have a higher chance to satisfy the audience. If hospitals and educational channels focus their videos more on treatment options, they can better help to drive traffic to their video and elicit a more favorable response from their audience. This will help to not only educate patients better, but also provide for a more captivating video.

4.3 Context

YouTube contains a variety of educational videos in the medical field. There is however no review process for the videos being uploaded, unlike journal publications. The quality may therefore be poor and unreliable[4,24]. Many videos had some elements included, e.g. diagram, whilst excluded others, e.g. results of treatment, which in combination contributed to a lower holistic score. This resulted in many videos that were informative to some extent, but did not get a higher DISCERN score due to not fulfilling other criteria. Currently, we emphasize that YouTube should not be used for education about hydrocephalus, but only for additional accessory information such as images, diagrams, listening to medical trained personnel, or just for the pure enjoyment of watching videos. Still, commonly accepted medical literature and publications should be used as a first source of information, however, since they are not the friendliest for laymen, we encourage medical videos uploaded to YouTube to be of better quality. Surveys have shown that many patients would like to be guided across the internet to be able to acquire better information[25]. Therefore, a recommendation for physicians is to be aware of these pitfalls, and be able to guide the patient for further information on the internet, recommending either certain YouTube videos and webpages of high quality but also of high ethics, as shown in earlier publications[26]. This is of highest importance, since many users do not have the search or evaluations skills required to systematically find correct information on the internet. Users often search for the incorrect terms or conditions, often misspelled, as shown in earlier research[27].

A 2015 review analyzing the healthcare information on YouTube found that videos included mostly misleading information, which matches our findings since the overall video quality was poor. However, the review also found that professional associations uploaded high-quality

information. Our findings differ in this regard (if we consider hospitals professional organizations) since even hospitals channels had an overall mean DISCERN score of 31.553 indicating that the quality of YouTube videos was still poor[4].

4.4 Limitations

In this paper the two evaluators were final year medical students instead of two neurosurgeons; meaning it was not specialists who watched and rated the videos. However, the DISCERN instrument was designed and validated for "patients and information providers" to score and evaluate the videos as objectively and unbiased as possible[28]. Meaning the DISCERN instrument was made for people having less knowledge about the topic compared to a medical student. The interrater agreement on 0.96 (0.0–1.0) was very high, showing that the results of the quality analysis are robust.

4.5 Future Directions:

We recommend that this study be repeated in a few years to see if there is a change in the content quality of YouTube videos. We encourage hospitals to read and better prepare educational YouTube material so that the content is optimized for viewer engagement and contains a more robust content quality.

5.0 Conclusion:

Our study shows that YouTube videos concerning hydrocephalus have an overall poor quality and therefore, are poor sources of information for patients that wish to learn more about

hydrocephalus. However, if guided search practices are followed, YouTube may be used as an effective information resource. In our paper we have listed the highest educational quality videos concerning hydrocephalus as a helpful reference for physicians and patients. Patients should always verify information given in videos with more authoritative information sources to make the best and most effective healthcare decisions. We recommend YouTube content creators on hydrocephalus include diagrams and explain the results of surgical treatment as it results in higher audience engagement.

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Figure legend:

Figure 1: Videos contents for hydrocephalus. Abbreviation: CSF - cerebrospinal fluid.

Figure 2: Source of video uploads on hydrocephalus.

Figure 3: Violin and box plot for the overall distribution of DISCERN scores among the two raters.

#	Question	Rating
1	Are the aims clear?	1 2 3 4 5
2	Does it achieve its aims?	1 2 3 4 5
3	Is it relevant?	1 2 3 4 5
4	Is it clear what sources of information were used to compile the publication (other than the author or producer)?	1 2 3 4 5
5	Is it clear when the information used or reported in the publication was produced?	1 2 3 4 5
6	Is it balanced and unbiased?	1 2 3 4 5
7	Does it provide details of additional sources of support and information?	1 2 3 4 5
8	Does it refer to areas of uncertainty?	1 2 3 4 5
9	Does it describe how each treatment works?	1 2 3 4 5
10	Does it describe the benefits of each treatment?	1 2 3 4 5
11	Does it describe the risks of each treatment?	1 2 3 4 5
12	Does it describe what would happen if no treatment is used?	1 2 3 4 5
13	Does it describe how the treatment choices affect overall quality of life?	1 2 3 4 5
14	Is it clear that there may be more than 1 possible treatment choice?	1 2 3 4 5
15	Does it provide support for shared decision making?	1 2 3 4 5
16	Based on the answers to all of these questions, rate the overall quality of the publication as a source of information about treatment choices	1 2 3 4 5

Table 1: The 16 question DISCERN Instrument

	Intraclass correlation *	95% Confidence Interval
Single measures †	0.922	0.875 to 0.952
Average measures ‡	0.960	0.933 to 0.976

Table 2: Intraclass correlation coefficient for the DISCERN scores among the two raters. *The degree of absolute agreement among measurements. † Estimates the reliability of single ratings. ‡ Estimates the reliability of averages of *k* ratings.

	*With info	†Without info
	Like Ratio	
Diagrams		
Mean	99.2767	92.4302
95% Confidence Interval	98.0492 to 100.5041	88.2564 to 96.6040
Sample Size	6	49
P value	P=0.0398	
	Discern Score	
Clear information		
Mean	30.4912	24.0833
95% Confidence Interval	28.2178 to 32.7647	20.1649 to 28.0018
Sample Size	57	6
P value	P=0.0350	
Symptoms of Hydrocephalus		
Mean	31.6026	27.0833
95% Confidence Interval	28.5732 to 34.6319	24.6214 to 29.5453
Sample Size	39	24
P value	P=0.0387	
Risk Factor During Surgery		
Mean	39.5667	26.8542
95% Confidence Interval	34.1631 to 44.9702	25.3724 to 28.3360
Sample Size	15	48
P value	P <0.0001	
Results of Treatment		
Mean	32.6912	26.5862
95% Confidence Interval	29.2126 to 36.1698	24.9149 to 28.2575

Sample Size	34	29
P value	P=0.0109	
Steps How to do the Procedure		
Mean	38.6333	27.1458
95% Confidence Interval	33.0842 to 44.1825	25.5109 to 28.7807
Sample Size	15	48
P value	P <0.0001	
Prognosis		
Mean	36.6563	27.5745
95% Confidence Interval	30.7821 to 42.5304	25.8447 to 29.3042
Sample Size	16	47
P value	P=0.0012	
Animation		
Mean	33.6591	27.8537
95% Confidence Interval	28.8223 to 38.4959	25.9716 to 29.7357
Sample Size	22	41
P value	P=0.0398	
Radiological Images		
Mean	36.4063	27.6596
95% Confidence Interval	30.0623 to 42.7502	26.0604 to 29.2587
Sample Size	16	47
P value	P=0.0052	
Diagrams		
Mean	44.0833	28.3860
95% Confidence Interval	31.0626 to 57.1040	26.6868 to 30.0851
Sample Size	6	57

P value	P=0.0011	
Cerebrospinal fluid circulation explained		
Mean	31.6026	27.0833
95% Confidence Interval	28.5732 to 34.6319	24.6214 to 29.5453
Sample Size	39	24
P value	P=0.0387	
	Number of Comments	
Results of Treatment		
Mean	6.0882	1.,5517
95% Confidence Interval	-1.4342 to 13.6107	5.8109 to 27.2925
Sample Size	34	29
P value	P=0.0360	
	***With info**	**†Without info**
	Average Daily View	
Results of Treatment		
Mean	5.9437	18.9703
95% Confidence Interval	3.6659 to 8.2216	9.5843 to 28.3564
Sample Size	34	29
P value	P=0.0229	
	***With info**	**†Without info**
	Duration (Seconds)	
Symptoms of Hydrocephalus		
Mean	895.4615	481.7500
95% Confidence Interval	538.9043 to 1252.0187	181.3029 to 782.1971
Sample Size	39	24

P value	P=0.009	
Risk Factors During Surgery		
Mean	1610.2000	465.2500
95% Confidence Interval	937.2571 to 2283.1429	255.5780 to 67.9220
Sample Size	15	48
P value	P = 0.0001	
Steps How to do the Procedure		
Mean	1403.1333	529.9583
95% Confidence Interval	774.8163 to 2031.4504	285.0852 to 774.8314
Sample Size	15	48
P value	P=0.0013	
Radiological images		
Mean	1279.6875	553.4043
95% Confidence Interval	655.4848 to 1903.8902	303.6596 to 803.1489
Sample Size	16	47
P value	P=0.0203	
Diagrams		
Mean	2320.3333	571.2807
95% Confidence Interval	977.2963 to 3663.3703	360.4230 to 782.1384
Sample Size	6	57
P value	P=0.0111	
Cerebrospinal fluid circulation explained		
Mean	1055.2000	677.9811
95% Confidence Interval	379.2793 to 1731.1207	405.2000 to 950.7623
Sample Size	10	53

P value	P=0.0252	
Anatomy of the ventricular system		
Mean	1525.5000	654.9474
95% Confidence Interval	513.6553 to 2537.3447	400.7455 to 909.1492
Sample Size	6	57
P value	P=0.0081	
	Video Power Index	
Results of Treatment		
Mean	0.04257	0.18085
95% Confidence Interval	0.021848 to 0.063291	0.090354 to 0.27135
Sample Size	34	29
P value	P=0.0007	

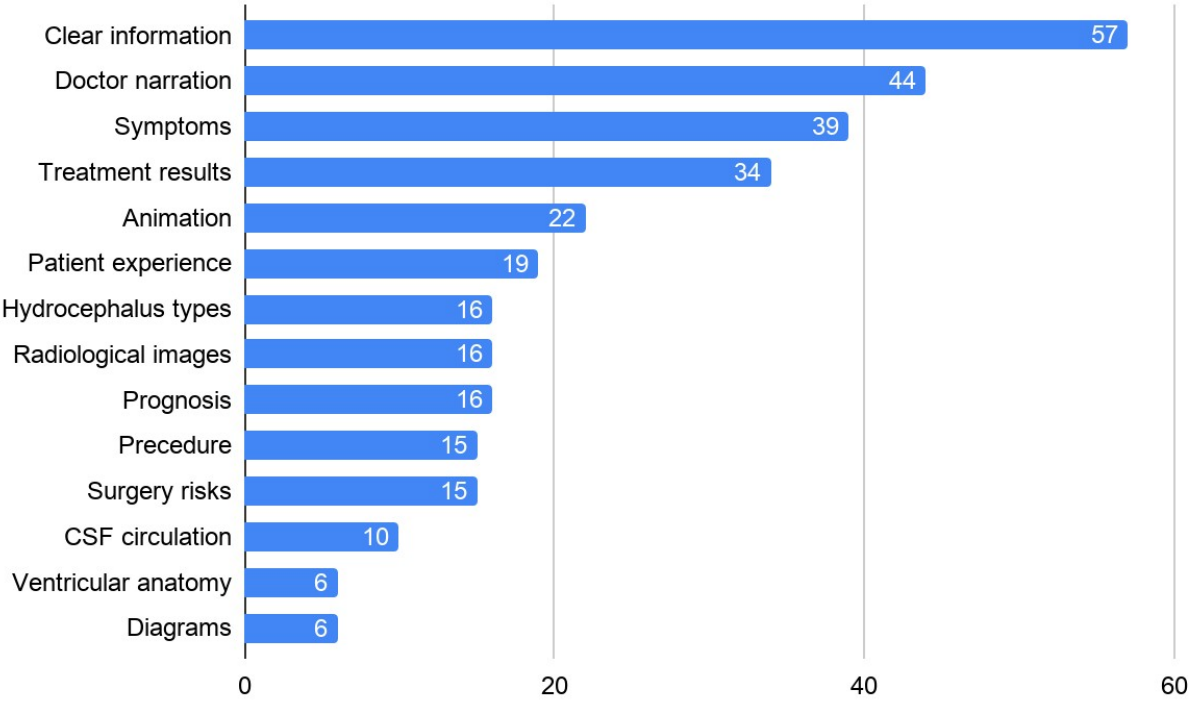
Table 3: Statistically significant relationships and selected qualitative video content.

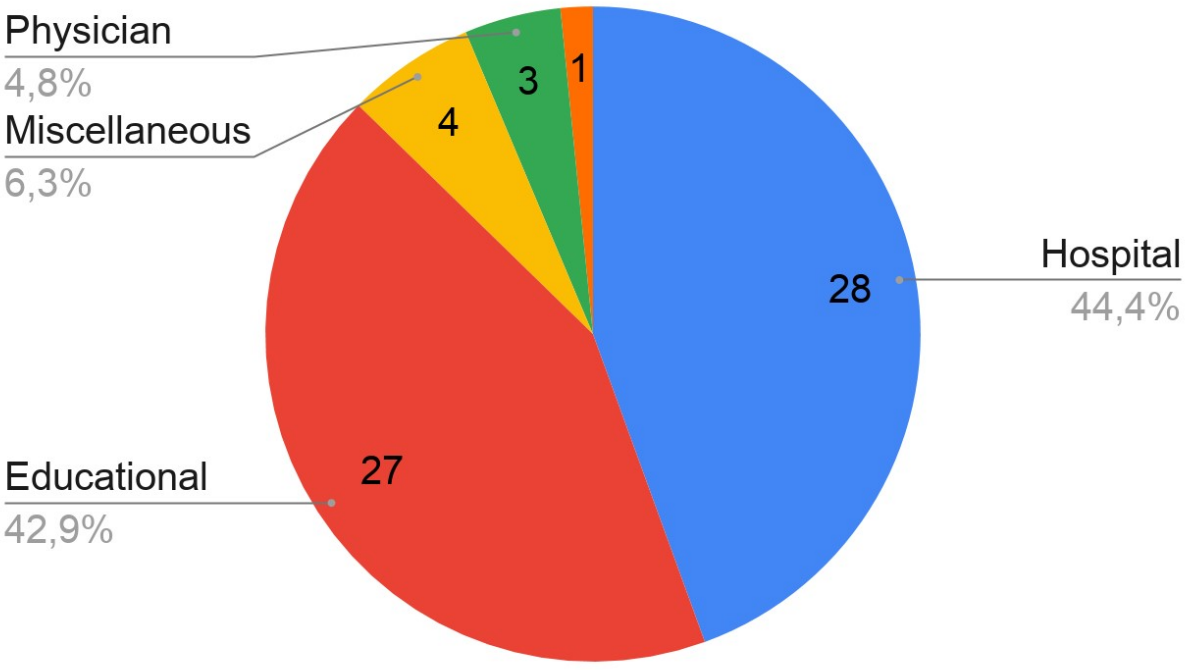
VPI	DISCERN	Title	Uploader	YouTube ID
1.064	33	Hydrocephalus and its treatment | Boston Children's Hospital	Boston Children's Hospital	bHD8zYImKqA
0.550	27.5	2-Minute Neuroscience: Hydrocephalus	Neuroscientifically Challenged	JLNI2upLi7I
0.523	21.5	Classic NPH Gait Pre-Shunt Surgery	Hydrocephalus Association	hziyFfJTrQo
0.431	32	Problems With Shunts for Hydrocephalus	Carilion Clinic	4VnFlL4ca6o
0.461	25	239 – Hydrocephalus, Dandy-Walker and Arnold-Chiari – USMLE STEP 1, USMLE ACE	USMLE ACE INC	DHYtO1E_ItQ

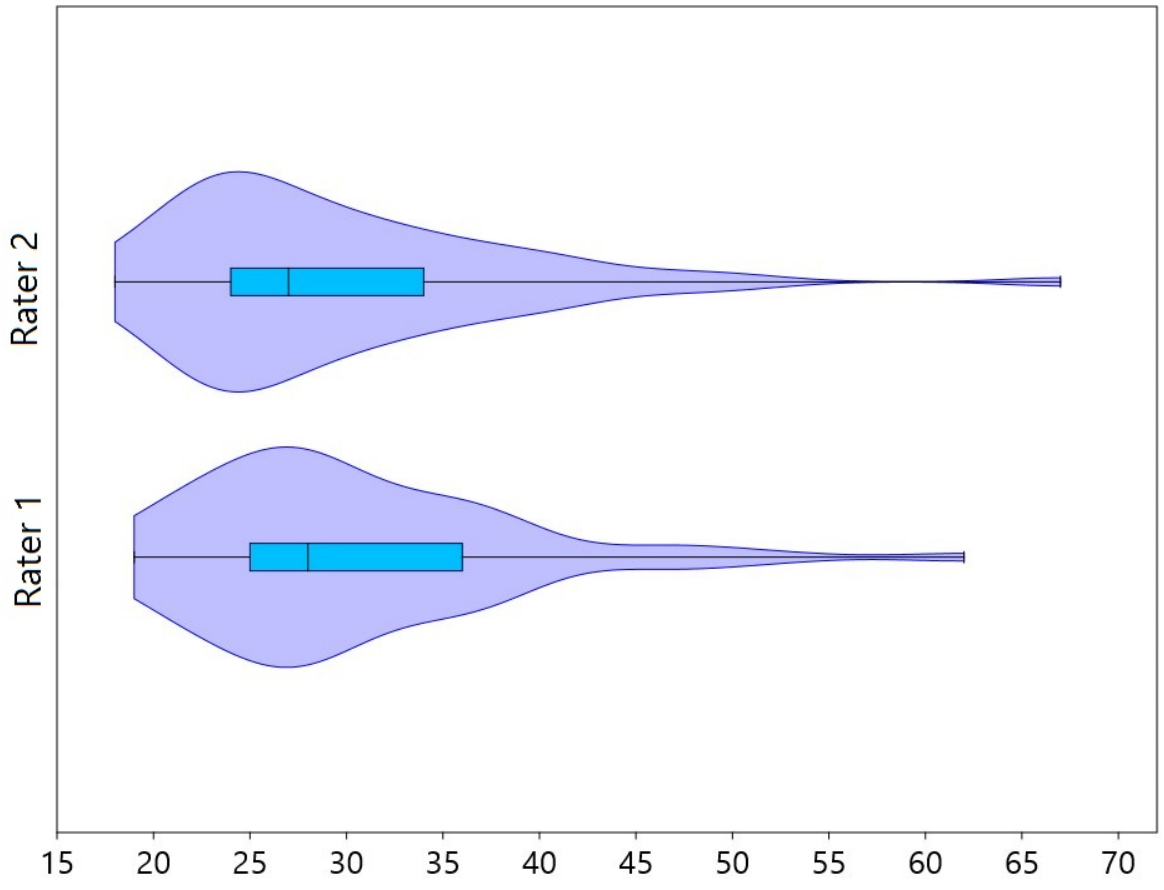
Table 4: The top five most popular hydrocephalus videos based on the VPI criteria.

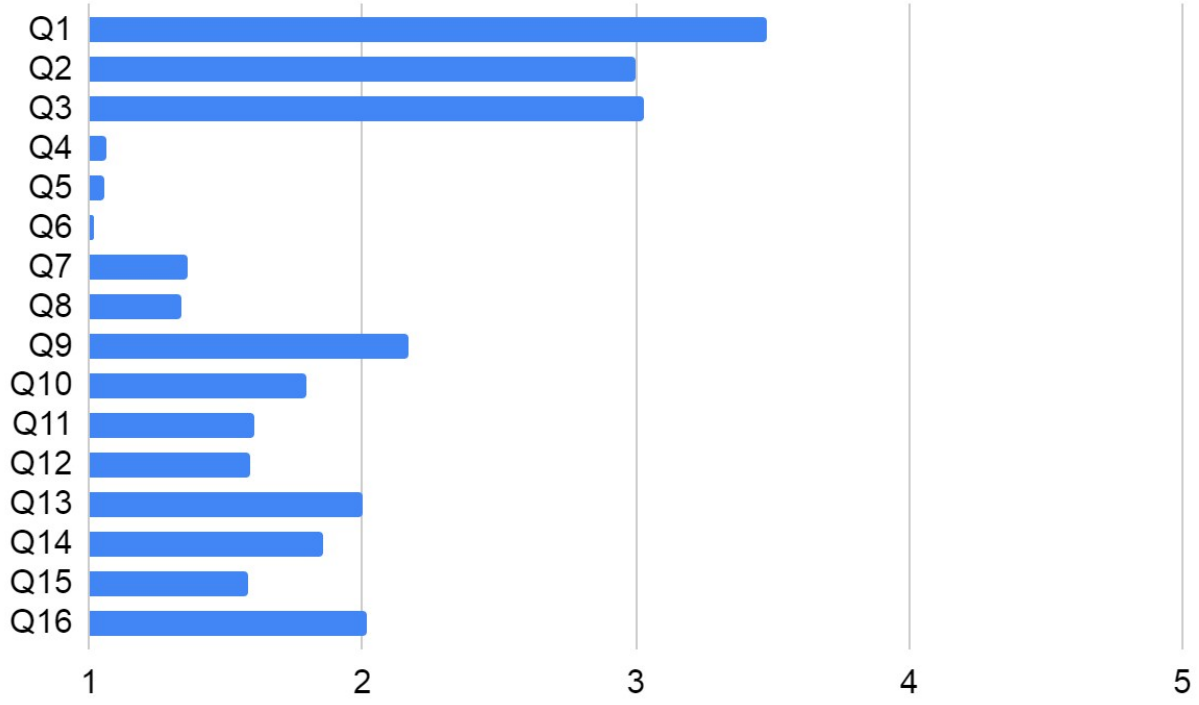
DISCERN	VPI	Title	Uploader	YouTube ID
64.5	0.017	"Searching for the Optimal Treatment of Infant Hydrocephalus" by Benjamin Warf for OPENPediatrics	OPENPediatrics	galu-1Uk0Cs
51.5	0.139	Management of Pediatric Hydrocephalus | #UCLAMDChat Webinars	UCLA Health	CK83PdHf088
48	0.009	Pediatric Hydrocephalus with Dr. Sandberg	Memorial Hermann	1epbL1XSxDk
46.5	0.090	Hydrocephalus (Hydrodynamic CSF disorder)	Medcrine	bQCgIthM01I
43	0.005	Mark Hamilton, M.D. - Adult Hydrocephalus Treatment: How to Change the Current Paradigm	UW Medicine Neurosciences Institute	5q04PG_LJzU

Table 5: The top five highest quality hydrocephalus videos based on the DISCERN criteria.









Keywords: Hydrocephalus; Internet; Online; Neurosurgery; YouTube; Quality