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YouTube as a source of patient information on positron emission tomography

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ABSTRACT

Aim: With the technological developments and the widespread use of smart phones, patients frequently use the internet to get information. YouTube is also one of the most popular sources for patient information. Positron emission tomography is one of the most common and important imaging methods specific to nuclear medicine. The aim of this study was to investigate the videos on YouTube about positron emission tomography imaging.

Material and Method: This study was conducted in October 2022. Videos were accessed on YouTube using the keywords "positron emission tomography" and "pozitron emisyon tomografisi". These videos were evaluated using the global quality scale (GQS), the DISCERN scale, and the Journal of the American Medical Association (JAMA) benchmark criteria.

Results: In total, 123 videos were reviewed and 75 videos were included in the study. Most of these videos were uploaded by non-physician person. The number of views, the number of comments, the number of video likes and the viewing rate of the non-physician sourced videos were found to be higher than the physician sourced videos. On the other hand, JAMA scores, GQS scores and DISCERN scores of non-physician sourced videos were found to be lower than physician sourced videos. These findings were statistically significant. In addition, significant positive correlations were found between JAMA score, GQS score and DISCERN score.

Conclusions: Widely used YouTube platform for any information. Patients and their relatives can also search specifically for any disease and treatment. Physicians and specialty associations can upload official videos to the YouTube platform to ensure that patients have access to higher quality and more accurate content. URLs of these videos can also be added to patient information forms.

Keywords: Video-audio media, quality control, nuclear medicine, information source, internet

INTRODUCTION

Positron emission tomography/computed tomography (PET/CT) is one of the most commonly performed and significant imaging modality specific to the nuclear medicine (1). PET/CT imaging using various radiopharmaceuticals is widely established in the diagnosis and follow-up of the oncological diseases. PET/CT frequently has a significant impact and contribution on the management of these patients (2). In addition PET/CT can detect molecular and metabolic changes before structural disorders and enables substantial contribution for prognostic information and disease recurrence (3).

Although the reasonability and the procedure of the PET/CT examination is explained to the patients by the primary clinician, it may not be fully understood and imagined by the patients. From the patient's point of view, PET/CT is an examination that they do not know much about, unlike conventional radiology. Before the examination, an informed consent form about the rationale of the procedure, possible side effects and radiation protection rules is inevitably taken. Despite all these information provided, some patients and their caregivers may be concerned about the procedure and may have desire for more information. For this purpose, they can use the internet to access free information easily. Internet access has become easier by widespread use and technological development of service provides, computers and smart phones. Therefore, it is popular to search online websites which can provide free and fast access to the information. In some studies, it has been reported that approximately 80% of internet users obtain medical information using the internet (4-6). In a few studies, it has been reported that approximately 75% of internet users are affected after searching for their illness on the internet (7, 8). However, the information obtained may be inaccurate, incomplete, irrelevant or biased (5, 9). One of the leading

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and common sources of online information for public is YouTube. New videos are constantly being uploaded to YouTube (10). The laxity of regulatory mechanisms in the video upload phase of YouTube raises doubts about the accuracy, reliability and quality of the uploaded content. This raises concerns about YouTube, which has significant potential in sharing medical information to public (5). In the literature, there are many studies that analyze the quality of the medical videos on YouTube (11-20). However, as far as we know, there is no similar study analyzing YouTube videos about PET/CT.

This study aims to assess the quality of video content by analyzing PET/CT related YouTube videos. Clarification of the quality and reliability of PET/CT related YouTube videos may enable directing patients and caregivers to the right sources, and can raise awareness for uploading scientifically reliable video content.

MATERIAL AND METHOD

This cross-sectional study was performed by using the 'YouTube' video-sharing website. The terms "positron emission tomography" and "pozitron emisyon tomografisi" were used for searching videos on October 2022. All procedures were carried out in accordance with the ethical rules and the principles. The options 'video' and 'sort by number of views' were selected as filters. All of the URLs received were recorded in an 'Excel' sheet and assessed by a nuclear medicine specialist experienced in this imaging modality. These searches were performed from a completely new account in Turkey to ensure that the search results are not affected by Youtube's existing algorithms for tailoring videos to certain people. The inclusion criteria were as follows: English videos on "positron emission tomography" and Turkish videos on "pozitron emisyon tomografisi". The exclusion criteria were as follows: Duplicate videos, inaccessible videos, contents unrelated to positron emission tomography, and videos in a language other than English and Turkish.

The duration of the video (seconds), the time passed since video upload (days), number of total views, total number of comments, number of comments per year, number of likes and dislikes, video like ratio [like/(like+dislike) ×100], video view ratio [number of views/days] were recorded during the evaluation procedure. Video power index (VPI) [like ratio×view ratio/100] which is used to determine the video popularity level was also calculated for each video.

The sources of the videos were analyzed into two categories as 'physician' and 'other than physician'. The quality of the videos was assessed by using the Journal of the American Medical Association (JAMA) benchmark criteria, the DISCERN Scale and the Global Quality Scale (GQS).

GQS is a 5 point instrument used to evaluate the quality, flow and ease of use for the video content as 1-2 points indicate low quality, 3 points indicate intermediate quality and 4-5 points indicate high quality (21).

The DISCERN scale is an instrument that consists of questions on the quality of information about treatment options, reliability and quality of the overall content. It has a score range of 0-80 points, with higher scores indicating the advanced level of quality (22).

JAMA benchmark criteria, which is used to evaluate the video reliability and accuracy, includes the parameters of 'authorship', 'attribution', disclosure' and 'validity' with 1 point assigned for the presence of each criterion. A score of 0 demonstrated poor reliability and accuracy; 4 points shows higher reliability and accuracy (23).

Since our study did not include any animal or human participants and the videos that incorporated in this study were accessible for everyone; the study did not require the approval of the ethics committee. There are similar studies with the same protocol in the literature (11, 13, 15).

Statistical Analysis

Statistical analyses were performed using the Statistical Package for the Social Sciences (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). Descriptive statistics specified numbers and percentages (%) for categorical variables. The mean and standard deviation were specified for the normally distributed continuous variables. The median was specified for continuous variables that did not show normal distribution. The conformity of the variables to the normal distribution was examined using histograms, probability charts, and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk test). Quantitative data according to the normal distribution characteristics were evaluated with the Mann Whitney U test or Student's t-test. Qualitative data were analysed with the chi-square test. The statistical significance level was chosen at a two-sided p-value of 0.05 or less.

RESULTS

A total of 123 videos (86 in English, 37 in Turkish) were assessed, and 75 videos (48 in English, 27 in Turkish) were included in the study according to the inclusion and exclusion criteria. Like ratio and video power index were excluded from the evaluation, as the number of dislikes for all the videos evaluated in our study was zero. Instead, only View ratio was used. While the source of 35 of these videos was physician, the source of 40 of them was non-physician. Examined videos were divided into three groups according to their GQS scores

as low, intermediate and high quality. Seven videos were rated as low quality, 32 as intermediate quality, and 36 as high quality. The classification of the content of the videos according to the video source and quality is summarized in **Table 1**.

The number of days since the upload of all videos, the length in seconds, the number of views, the number of comments, the number of likes, the number of comments per year, view ratio, Jama score, GQS score, Discern scores and quality classes are summarized in **Table 2**.

Table 1. The classification of the content of the videos according to the video source and quality

Content\Quality	Source						Total
	Physician			Non-physician			
	Low	Intermediate	High	Low	Intermediate	High	
How does it work?	0	1	1	1	5	4	12
How to imaging?	0	0	3	2	6	6	17
What to do before and/or after?	0	0	4	0	1	2	7
What is PET/CT?	2	6	5	0	5	1	19
What are the advantages?	0	2	4	0	1	1	8
Where to use?	1	1	5	1	4	0	12
Total	3	10	22	4	22	14	75

PET/CT positron emission tomography/computerized tomography

Table 2. General features of videos

	All (n:75)	Video Source		p value (physician vs. non-physician)
		Physician (n:35)	Non-physician (n:40)	
Time after upload (day)				
Mean±SD	2338±1323	2177±1386	2479±1265	0.367
Range	95-5009	95-4970	153-5009	
Video duration (second)				
Mean±SD	296±249	315±285	279±215	0.633
Range	52-1196	52-1196	74-1031	
Number of video views				
Mean±SD	97963±169557	39555±59447	149070±213844	<0.001
Range	916-962467	916-264060	1743-962467	
Number of comments				
Mean±SD	22.86±49.60	10.57±21.27	33.62±63.39	0.002
Range	0-360	0-110	0-360	
Number of video likes				
Mean±SD	588±1448	155±282	967±1895	<0.001
Range	0-9200	0-1400	0-9200	
Number of comments per year				
Mean±SD	6.45±16.84	4.09±9.22	8.52±21.32	0.034
Range	0-101	0-47	0-101	
View Ratio				
Mean±SD	44.05±62.37	29.57±51.32	56.72±68.79	0.004
Range	0.25-288.34	0.25-265.39	0.93-288.34	
JAMA score				
Mean±SD	2.54±0.59	2.91±0.50	2.22±0.47	<0.001
Range	1-4	1-4	1-3	
GQS				
Mean±SD	3.43±0.77	3.66±0.80	3.23±0.69	0.014
Range	1-5	2-5	1-4	
Discern Part 1				
Mean±SD	18.92±5.11	20.37±4.95	17.65±4.97	0.013
Range	9-33	11-30	9-33	
Discern Part 2				
Mean±SD	19.25±5.60	20.51±5.63	18.15±5.41	0.072
Range	7-30	10-30	7-29	
Discern Part 3				
Mean±SD	3.24±1.03	3.60±1.00	2.92±0.97	0.004
Range	1-5	2-5	1-5	
Total Discern score				
Mean±SD	41.38±11.10	44.42±10.89	38.72±10.71	0.025
Range	17-63	23-63	17-63	
Quality, n (%)				
Low	7 (9.3%)	3 (4.0%)	4 (5.3%)	0.047
Intermediate	32 (42.7%)	10 (13.3%)	22 (29.3%)	
High	36 (48.0%)	22 (29.3%)	14 (18.7%)	

SD standard deviation, JAMA Journal of the American Medical Association benchmark criteria, GQS global quality scale

Of the physician sourced videos, 3 were low quality, 10 were medium quality, and 22 were high quality. In videos of non-physician sourced, these numbers were 4, 22, 14, respectively (p: 0.047). The number of views, the number of comments, the number of likes, the number of comments per year, and the View ratio of the physician sourced videos were found to be significantly lower than the non-physician sourced videos. Jama scores, GQS scores, Discern Part 1 and Part 3 scores and total discern scores of physician sourced videos were found to be significantly higher than non-physician sourced videos.

The data of the videos analyzed by quality groups and languages are summarized in **Table 3**.

The number of views, the number of comments, the number of likes, the View ratio, Discern Part 1 and Part 2, and the total Discern scores of the English-language videos were found to be significantly higher than the Turkish-language videos. The number of views of the videos was found to be highest in the intermediate quality group with an average of 104,495.

Correlation analyzes were also performed between the data obtained in our study. There was moderate positive correlation between JAMA score and GQS score, weak positive correlation between JAMA score and Total Discern score, and high positive correlation between GQS score and Total Discern score (**Table 4**). No significant correlation was found in the separate correlation analyzes performed with JAMA score, GQS score, Total Discern scores with number of views, number of comments, number of likes, number of comments per year and view ratio.

Table 3. General features of videos according to quality and language

	Quality			p value	Language		p value
	Low	Intermediate	High		English	Turkish	
Time after upload (day)							
Mean±SD	1762±1440	2477±1338	2327±1294	0.427	2743±1276	1618±1092	<0.001
Range	153-3711	95-5009	193-4970		193-5009	95-3711	
Video duration (second)							
Mean±SD	278±337	247±179	343±280	0.179	330±261	236±218	0.020
Range	74-1031	52-872	92-1196		76-1196	52-1138	
Number of video views							
Mean±SD	42487±68825	104495±195426	102945±159583	0.337	132870±198687	35908±64932	<0.001
Range	916-186506	1743-962467	1130-808329		7040-962467	916-264060	
Number of comments							
Mean±SD	16.42±16.39	20.43±34.03	26.27±64.06	0.693	28.56±58.88	12.74±23.85	0.023
Range	1-40	0-136	0-360		0-360	0-110	
Number of video likes							
Mean±SD	371±654	351±561	840±1988	0.761	857±1754	109±175	<0.001
Range	22-1800	0-2100	0-9200		0-9200	4-724	
Number of comments per Year							
Mean±SD	17.08±34.704	3.41±5.25	7.10±18.37	0.293	5.29±14.75	8.51±20.17	0.457
Range	0-95	0-22	0-101		0-101	0-95	
View Ratio							
Mean±SD	24.23±23.45	40.72±59.42	50.87±49.76	0.792	50.00±64.85	33.47±57.33	0.011
Range	0.25-66.47	0.93-288.34	0.44-265.39		1.81-288.34	0.25-265.39	
JAMA score							
Mean±SD	2.00±0.57	2.28±0.52	2.88±0.46	<0.001	2.50±0.54	2.62±0.68	0.217
Range	1-3	1-3	2-4		2-4	1-4	
Discern Part 1							
Mean±SD	12.57±3.10	16.15±3.36	22.61±3.83	<0.001	20.02±4.95	16.96±4.90	0.018
Range	9-18	11-25	16-33		11-33	9-25	
Discern Part 2							
Mean±SD	12.14±2.91	16.56±4.25	23.02±4.19	<0.001	20.22±5.12	17.51±6.09	0.045
Range	7-16	10-26	14-30		12-30	7-30	
Discern Part 3							
Mean±SD	2±0.57	2.56±0.61	4.08±0.64	<0.001	3.29±1.03	3.14±1.06	0.655
Range	1-3	2-4	3-5		2-5	1-5	
Total Discern score							
Mean±SD	26.71±5.05	35.28±7.32	49.66±7.80	<0.001	43.54±10.40	37.55±11.44	0.028
Range	17-32	23-51	35-63		26-63	17-57	

SD standard deviation, JAMA Journal of the American Medical Association benchmark criteria, GQS global quality scale

Table 4. Correlation relationship between JAMA, GQS and Total Discern

	p	r
JAMA vs GQS	<0.001	0.589
JAMA vs Total Discern	<0.001	0.463
GQS vs Total Discern	<0.001	0.781

JAMA Journal of the American Medical Association benchmark criteria, GQS global quality scale

DISCUSSION

PET is far the most important imaging modality of nuclear medicine for oncological diseases (2). Because of the patients directed to PET/CT exam are mostly worried about their own health at the appointment, they may not benefit enough from the verbal and written information given. Patients and caregivers may seek alternative ways to learn more about the rationale of this unfamiliar imaging and radiation exposure. Today, internet research and especially search of YouTube constitutes the majority of these alternative ways.

In our study, PET/CT related videos on YouTube were evaluated and analyzed. Most of them were uploaded by non-physicians. The number of views, the number of comments, the number of video likes and the view ratio of the videos of non-physician sourced were found to be higher than the videos of physician sourced. On the other hand, JAMA scores, GQS scores and DISCERN scores of non-physician sourced videos were found to be lower than physician sourced videos.

In a study by Şan (20), the quality of 270 YouTube videos about 'radionuclide treatments' were evaluated. While the best quality videos were found to be physician sourced, it was seen that the most watched and highest VPI videos were non-physician sourced videos. Consistent with our study, the average number of views, the number of comments, the number of annual comments, the number of video likes, and the VPI values of physician sourced videos were found to be lower than non-physician sourced videos. JAMA scores, GQS scores and DISCERN scores were found to be higher in physician sourced videos.

In another study of Şan (19), YouTube videos related to 'radioactive iodine treatment' were evaluated. Similar to our study, the average number of comments, annual number of comments, number of likes, number of views, and VPI values of physician sourced videos were found to be lower than non-physician sourced videos. In this study, a classification was made according to the video languages. While the number of views, the number of likes, the number of comments and the number of annual comments of the English language videos were found to be higher than the Turkish language videos, there was no difference between the JAMA scores, GQS scores, Discern scores and VPI values. In our study, the number of views, the number of comments and the number of likes of the English language videos were found to be higher, in line with these results. However, contrary to aforementioned study, the VPI values, JAMA scores and DISCERN scores of the videos in English were also found to be higher than the videos in Turkish. This inconsistency may be due to more careful and scientific preparation of the content of those videos.

In a study examining the role of YouTube videos in informing patients in myofascial pain syndrome, 186 videos were analyzed (17). Contrary to our study, physician sourced videos were the most watched and commented videos.

YouTube is a free social platform and anyone can upload videos with random content. As in every field, there are many videos with medical information that is not checked for appropriate content (5). It is important for the medical videos to pass certain filters of quality in order not to mislead public. For this purpose, content of medical videos may be evaluated with any of the parameters of JAMA, GQS and DISCERN. Studies have reported that there is a high positive correlation between these three parameters (18-20). In our study, significant positive correlations were found between JAMA score, GQS score, and DISCERN score.

In our study, we divided the videos into quality groups according to the GQS scores. Videos with a score of 1-2 were evaluated as low quality, 3 as intermediate quality, and 4-5 as high quality. In the study of Koçyiğit et al. (14), Youtube videos were examined as a source of information for ankylosing spondylitis and most of the videos were for found high-quality (48.2%). In another study, Youtube videos about COVID-19 and rheumatological diseases were analyzed, and 41.4% of the videos were found as high quality (15). Similar to these studies, we found that 36 (48.0%) of the 75 videos included in our study were of high quality. However, there are also studies in the literature in which most of the videos are evaluated as low quality (12, 17, 19) and medium quality (20), which is inconsistent with these findings .

In the study of Koçyiğit et al. (14), the videos grouped according to their quality and found to be similar in terms of video views, video likes and video comments. There was a significant difference between the groups in terms of DISCERN score. Since DISCERN score also reflect the video quality, it is natural that there is a significant difference between the groups. In the study analyzing YouTube videos about myofascial pain syndrome, the most popular, most liked and most watched videos were medium quality. In that study, the least popular, least liked and least watched videos were high quality (17). In the study of Şan (19), analyzing the radioactive iodine treatment related YouTube videos, the

the most liked, commented and the videos with highest VPI was the medium quality group. In that study, the group with the lowest popularity, number of views and likes was the high quality group. In our study, the highest number of views was in the medium quality group, while the number of comments, number of likes and view ratio (VPI) were the highest in the high quality group. However, these differences between the quality groups in our study were not statistically significant. In line with our findings, Zengin et al. (11) examined YouTube videos on musculoskeletal ultrasound training and found the medium quality videos as the most viewed videos. In addition, they found the high quality group as the most liked and with the highest VPI.

Information given to patients and caregivers may not be effective because of reduced attention due to momentary stress of their disease and radiation exposure concern. In addition, PET/CT imaging is less known compared to conventional radiology. They may use social platforms such as YouTube, where they can access almost any true or unreal information. In our study, most of the YouTube videos were non-physician sourced and these were of lower quality than physician sourced videos. Paradoxically, they were watched and liked more, and their view ratio were higher. There are similar studies in the literature in which physician sourced videos constitute the majority (18). In these studies, non-physician sourced videos with less quality were evaluated as the most popular, the most liked, and the most watched videos. It may be beneficial to upload official videos of specific physician associations in order to sharing videos with higher quality content to public. Although there are studies in the literature stating that medium quality and low quality videos constitute the majority, most of the videos we examined in our study were high quality videos, but the total of low and medium quality videos was still higher (n: 39). This may lead to incorrect and/or incomplete information shared to patients. For this reason, on YouTube platform with careless control mechanism for upload, significant need for medical related videos to pass qualified filters.

Study Limitations

Our study includes some limitations. We were not able to evaluate all PET-related videos and only analyzed some of the videos in Turkish and English. Most of the videos we included in our study consisted of videos in English language. These videos were significantly higher in terms of the number of views, the number of likes, view ratios and DISCERN score compared to the videos in Turkish. This may be due to the fact that videos in English can reach more people in the world. If videos in other languages were also included in the evaluation, the results may be changed.

CONCLUSION

On YouTube platform is widely used for any information and patients and their caregivers can also search for any disease and treatments especially. Physicians and speciality associations may upload official videos to YouTube platform and add URL's to patient information forms so that patients may access better quality and more accurate content.

ETHICAL DECLARATIONS

Ethics Committee Approval: This study does not require an ethics committee.

Informed Consent: This study does not require an informed consent.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The author has no conflicts of interest to declare.

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Author Contributions: The author declares that he has all participated in the design, execution, and analysis of the paper and that he has approved the final version.

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