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YouTube as a source of recognizing acute stroke; progress in 2 years

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Abstract

Background YouTube™ has a great role in providing information, which includes educational videos, to more than 2 billion users, making it the second most popular application in the world. BE-FAST is a modified version of the FAST mnemonic and is used to detect acute ischemic stroke by the patients or their relatives. The purpose of this study is to assess the overall usefulness of the information of YouTube in patients to realize an acute stroke attack.

Methods YouTube was searched for the following five terms: "stroke", "stroke diagnosis", "stroke signs", "brain attack" and "what is stroke" in November 2021 and May 2023, separately. Two independent neurology specialists scored each video by using Global Quality Scale (GQS).

Results Among the total of 150 videos, the number that met inclusion criteria was 91 for the November 2021 search and 104 for the May 2023 search. For the 2021 search, in 30 videos (33%), the FAST mnemonic or its contents were noticed, whereas BE-FAST was mentioned in only four videos (4.4%). For the 2023 search, the FAST mnemonic or its contents were noticed in 36 videos (34.6%) and BE-FAST was mentioned in 11 videos (10.6%). Among the 2021 and 2023 searches, the mean GQS values were 3.09 and 2.96 points, 50 (54.8%) vs. 56 (53.8%) videos rated 3.5 points or higher (high quality), respectively. GQS scores of the videos mentioning balance, eyes, face, arms, speech, and time, the basic and advanced information about radiology and treatment, and mentioning FAST, BE-FAST, and TPA were significantly higher.

Conclusion We conclude that YouTube is not yet a very useful tool for patients to realize that they may have acute ischemic stroke, though over the years; information available on social media for healthcare information and education has improved.

Keywords YouTube, Stroke, BE-FAST, FAST, tPA

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Introduction

Stroke is the second-leading cause of death worldwide after ischemic heart disease [1]. With the increasing numbers of stroke incidence, stroke survivors, disability-adjusted life-years (DALYs), and deaths related to stroke, awareness about acute stroke recognition and the role of acute treatment become prominent [2]. The Internet has become a frequently used source for health information by patients and healthcare professionals. As a separate source of data, YouTube has a great role in providing information, which includes educational videos, to more than 2 billion users, making it the second most popular application in the world [3, 4]. Since stroke is an emergent and life-threatening condition, the role of internet sources like YouTube play an important role in the behavior of patients and their relatives. Since the symptoms may be missed by the patients and the people around them, some diagnostic tools like FAST and BE-FAST are used to identify a possible stroke. The objective of this study is to assess if YouTube is a useful tool for patients or their relatives to identify a possible acute stroke attack when they have stroke-like symptoms, which is very critical for emergent intervention.

BE-FAST

It's thought that, if not treated, large vessel occlusion stroke (LVO) causes loss of about 2 million neurons in one minute [5]. With the development of treatment strategies for acute ischemic stroke, the time of arrival at the hospital following the onset of symptoms—called time to door (TTD)—has gained critical significance. Several diagnostic scales have been studied for patients with stroke symptoms for early diagnosis and proper treatment [6, 7]. The American Heart Association (AHA) presented one of the most useful tools, the FAST mnemonic (face, arms, speech, time), which has an 88% sensitivity rate for anterior circulation ischemic strokes (anterior IS) [8]. The disadvantage of this scale is that it misses up to 40% of posterior circulation ischemic strokes (posterior IS) [9–11].

BE-FAST (balance, eyes, face, arms, speech, time) is a modified version of the FAST mnemonic and is more sensitive to anterior IS symptoms (96%) compared to posterior AIS (57%) [12]. The modification with balance and vision symptoms has proven to reduce the number of missed strokes and increase treatment of acute ischemic stroke patients [12]. Our aim was to use the Global Quality Scale (GQS) to determine whether the videos about stroke on YouTube are beneficial enough for non-healthcare people.

Methods

Search strategy and data collection

We searched YouTube for the following five terms: "stroke", "stroke diagnosis", "stroke signs", "brain attack" and "what is stroke". We conducted searches in November 2021 and May 2023, separately. Our aim was to compare the course of video content quality on YouTube. The results were sorted using default search option, relevance-based ranking. We assessed the first 30 videos for each term according to an internet search engine analysis that concludes more than 90% of users choose the results within the first three pages or first 30 videos [13]. We didn't need permission from YouTube since all the data utilized was publicly available and no special access was required for collecting the data. Video ID and duration, number of views, likes, dislikes, and comments were recorded. We used the video power index (VPI) [(like*100/(like +dislike)*(views/day)/100], interaction index [(number of likes−number of dislikes/total number of views)×100], and viewing rate (views/day) to analyze the effectivity of the video.

Inclusion and exclusion criteria

We recorded 150 videos in the database. Clearly non-relevant videos (e.g., humor videos), videos that were not in English, videos those are related to a limited area (e.g., just advanced imaging techniques or blood tests to determine early stroke), and duplicated videos were excluded. The remaining videos were analyzed.

Scoring

Two independent neurology specialists, who had more than 5 years of experience, assessed all videos by using the Global Quality Scale (GQS), which is based on the quality of information and the flow and ease of use of the information present online. The interclass correlation coefficient and Cohen's kappa coefficient were calculated for GQS score. The mean GQS score of the two observers was considered as the final score. We also added a specific criterion for stroke (BE-FAST), which is based on whether the video includes it.

The GQS adopts a five-point Likert type scoring system which is explained on Table 1.

We also accepted videos including BE-FAST criteria as good and videos not including BE-FAST criteria as poor.

Eleven content-specific items were also developed to assess whether videos discussed each of the items of BE-FAST (balance, eyes, face, arm, speech, time), etiology, pathology, anatomy, radiology, and treatment of stroke.

The GQS, BE-FAST, interaction index, and VPI criteria were correlated to see if the most popular videos are also the most informative.

Table 1 Global quality scale

Score	Description
1	Poor quality, poor flow of the site, most information missing, not at all useful for patients – I would highly discourage a patient with this disease from watching this video
2	Generally poor quality and poor flow, some information listed but many important topics missing, of very limited use to patients – I would discourage a patient w ith this disease from watching this video
3	Moderate quality, suboptimal flow, some important information is adequately discussed but others poorly discussed, somewhat useful for patients – I would neither encourage nor discourage a patient with this disease from watching this video
4	Good quality and generally good flow, most of the relevant information is listed, but some topics not covered, useful for patients – I would encourage a patient with this disease towatch this video
5	Excellent quality and excellent flow, very useful for patients – I would highly encourage a patient with this disease to watch this video

Statistical methods

Descriptive statistics (mean, standard deviation, minimum, median, maximum) were used to describe continuous variables.

The comparison of more than two independent and non-normally distributed variables was measured with the Kruskal Wallis test. The Mann-Whitney U test was used for the comparison of two independent and non-normally distributed variables.

Spearman's rho correlation analysis was used to analyze the relationship between two continuous non-normal distributed variables.

Statistical significance level was determined as 0.05. Analysis was performed using MedCalc Statistical Software version 12.7.7 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2013).

Table 2 Demographics of the videos

	2021 search (*n*=91)	2023 search (*n*=104)
Video source Hospital/ Professional	62 (68.1%)	81 (77.9%)
Video upload date (newest/oldest)	158 days/13 years	96 days/14 years
Videos uploaded after 2017	49 (54%)	122 (81.3%)
Median length of the videos (minutes)	5	8
Videos shorter than 5 minutes	55 (60%)	73 (70%)

Results

For the first and second steps of the research, the results are shown below.

Among the total of 300 videos (150 videos for each search), the number that met inclusion criteria was 91 for the November 2021 search and 104 for the May 2023 search. The exclusion criteria are summarized in Fig. 1. 37 videos were mutual in both searches.

For the 2021 search, the most recent video was uploaded 158 days prior, while the oldest video was posted over 13 years ago. More than half of the videos (54%; *n*=49) were produced after 2017, when the BE-FAST mnemonic had gained popularity.

The duration of the videos ranged from 59 s to more than 1 h. The median length of the videos was about 8 min for 2021 search and 5 min for 2023 search, while 60% (*n*=55) for 2021 search and 70% (*n*=73) for 2023 search were shorter than 5 min (Table 2).

For the 2023 search, the most recent video and oldest video upload dates were 96 days prior and about 14 years ago, respectively. The oldest one after the most recent video of the 2021 search was uploaded 579 days ago. 81.3% (*n*=122) of the videos were uploaded after 2017.

The source of almost all the videos from the 2021 search were individual healthcare professions (40.7%)
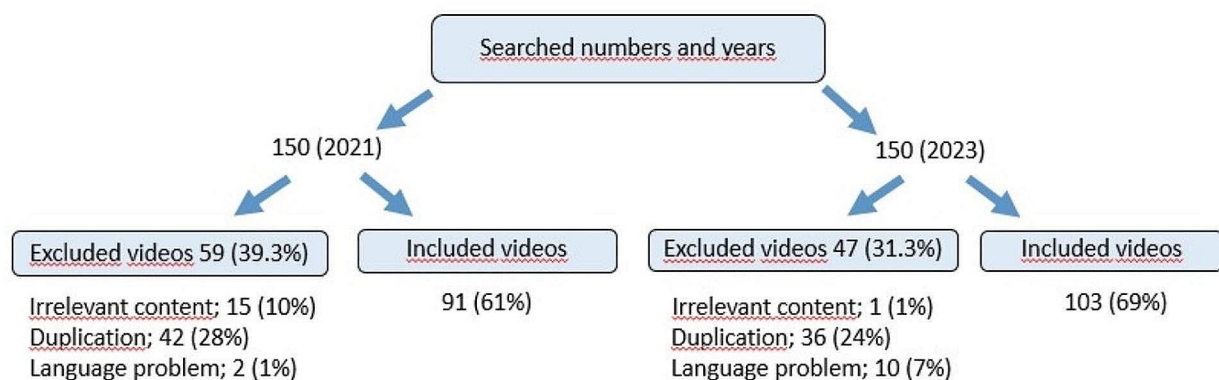
Fig. 1 Exclusion criteria of the YouTube videos

and healthcare institutions (68.1%), whereas only 2.2% of the videos were uploaded by patients with stroke experience. The percentages for the 2023 search were 42.3%, 77.9%, and 1.9%, respectively (Table 3).

The content of the videos was analyzed as to whether they include basic or advanced information about etiology, pathology, anatomy, radiology, and treatment of acute stroke. The basic and advancedinformation inclusion rates for the 2021 search are etiology: 51.6% and 7.7%, pathology: 39.6% and 11%, anatomy: 11% and 17.6%, radiology: 17.6% and 5.5%, and treatment: 44% and 9.9%. The rates for the 2023 search were etiology:

Table 3 Video content and aim

	2021 $N = 91$	2023 $N = 104$
ETIOLOGY		
No	37 (40.7%)	61 (58.7%)
Basic	47 (51.6%)	38 (36.5%)
Advanced	7 (7.7%)	5 (4.8%)
PATHOLOGY		
No	45 (49.5%)	52 (50.0%)
Basic	36 (39.6%)	44 (42.3%)
Advanced	10 (11.0%)	8 (7.7%)
ANATOMY		
No	65 (71.4%)	79 (76.0%)
Basic	10 (11.0%)	15 (14.4%)
Advanced	16 (17.6%)	10 (9.6%)
RADIOLOGY		
No	70 (76.9%)	80 (76.9%)
Basic	16 (17.6%)	19 (18.3%)
Advanced	5 (5.5%)	5 (4.8%)
TREATMENT		
No	42 (46.2%)	56 (53.8%)
Basic	40 (44.0%)	42 (40.4%)
Advanced	9 (9.9%)	6 (5.8%)
FAST		
No	61 (67.0%)	68 (65.4%)
Yes	30 (33.0%)	36 (34.6%)
BE-FAST		
No	87 (95.6%)	93 (89.4%)
Yes	4 (4.4%)	11 (10.6%)
TPA		
No	51 (56.0%)	69 (66.3%)
Yes	40 (44.0%)	35 (33.7%)
MEDICAL TERMINOLOGY		
No	75 (82.4%)	90 (86.5%)
Yes	16 (17.6%)	14 (13.5%)
TARGET GROUP		
Professions	14 (15.4%)	10 (9.6%)
Patients	75 (82.4%)	90 (86.5%)
Both	2 (2.2%)	4 (3.8%)
SOURCE		
Health institution	62 (68.1%)	81 (77.9%)
Health profession	37 (40.7%)	44 (42.3%)
Patient	2 (2.2%)	2 (1.9%)

36.5% and 4.8%, pathology: 42.3% and 7.7%, anatomy: 14.4% and 9.6%, radiology: 18.3% and 4.8%, and treatment: 40.4% and 5.8% (Table 3).

For the 2021 search, in 30 videos (33%), the FAST mnemonic or its contents were noticed, whereas BE-FAST was mentioned in only four videos (4.4%). (Table 3). The oldest video citing FAST was uploaded about 10 years ago, while the newest was 158 days old. The average days since upload was about 4.5 years. The videos including BE-FAST were uploaded 390, 939, 1021, and 1095 days ago.

For the 2023 search, the FAST mnemonic or its contents were noticed in 36 videos (34.6%) and BE-FAST was mentioned in 11 videos (10.6%) (Table 3).

In the 2021 search, the intravenous tissue type plasminogen activator (IV tPA) treatment was discussed in less than half of the videos (44%; $n = 40$). This ratio decreased when we searched in 2023 (33.7%; $n = 35$) (Table 3).

The target group of the contents were mostly patients (for 2021 and 2023 searches, 82.4% and 86.5%, respectively). 14 videos (15.4%) aimed to reach health professions in the 2021 search. That dropped to 10 (9.6%) in the 2023 search. Medical terminology was used in 16 videos (17.6%) in the 2021 search and 14 videos (13.5%) in the 2023 search (Table 3). Median statistics of both 2021 and 2023 searches were describes in Table 4.

When we compare the GQS statistics of the 2021 and 2023 searches, the mean values were 3.09 and 2.96 points, respectively (Table 5). 33 vs. 42 videos had 2.5 points or lower value, which means poor quality. Eight vs. six videos had a moderate quality, while 50 vs. 56 videos rated 3.5 points or higher (high quality). Only five videos across both searches met the excellent quality criteria with a GQS score of 5.

The Mann-Whitney U and Kruskal Wallis tests revealed that the following video contents showed a statistical significant difference for GQS: balance, eyes, face, arms, speech, time, treatment, and TPA ($p < 0.05$) for the 2021 search. The videos mentioning FAST and BE-FAST mnemonics were also strongly correlated with GQS scores ($p < 0.001$ and $p = 0.002$, respectively) for both searches. For the 2021 search, GQS scores were statistically higher in the videos that include radiology or did not use medical terminology ($p = 0.004$ and $p = 0.044$, respectively). GQS scores did not differ significantly among the videos that were produced by a doctor, another professional, or a patient, and if the videos were targeting patients, professions, or both. Accordingly, the videos that mentioned etiology, pathology, anatomy, as well as the ones including animation, did not correlate with GQS scores for both searches. The mean GQS scores of the videos mentioning balance, eyes, face, arms, speech, and time, the basic and advanced information about radiology and treatment,

Table 4 Video statistics

	2021 N=91	2023 N=104	
	Med (Min-Max)	Med (Min-Max)	p
VPI Score	96,73(80–100)	97,34(71,33–100)	0,866
Days since upload	1569(158–4888)	1515(96-5246)	0,612
Number of views	44,234(210-7219389)	30844,5(113-6333337)	0,739
Viewing rate (views/day)	30,62(0,09-2435,21)	22,26(0,11-14621,22)	0,614
Number of likes	367(2-72178)	208(0-89271)	0,617
Number of dislikes	14,5(0-1819)	6(0-2724)	0,745
Duration (seconds)	236(59-3934)	166,5(14-3934)	0,238
Number of comments	16(0-5195)	7,5(0-7066)	0,561
Interaction index	0,84(0,03–4,45)	0,94(0–5,63)	0,132

Table 5 Global quality scale results

	2021 N=91	2023 N=104	
	Mean±SD	Mean±SD	p
GQS-1st physician	3,25±1,2	3,14±1,35	
GQS-2nd physician	2,92±1,23	2,77±1,35	
GQS_mean	3,09±1,18	2,96±1,33	0,875

and mentioning FAST, BE-FAST, and TPA were significantly higher (Table 6).

The Spearman's rho correlation test showed that there was no correlation between mean GQS scores and VPI scores, number of views, viewing rate, number of likes, number of dislikes, number of comments, duration, and interaction index. There was a negative moderate correlation between days since upload and GQS scores ($p=0.004$), but only in the 2021 search.

When we compared the GQS scores of both searches, there was no statistical difference between the years 2021 and 2023. Total number of the videos with a GQS>3.5 were 50 (54.9%) in the 2021 and 56 (53.8%) in the 2023 search. When we analyzed the videos not included in the 2021 search, the ratio of the videos with a GQS score higher than 3.5 was 59.1% ($n=39$). Although the quality of the videos shows an increasing trend, there was still no statistical difference when comparing them (Table 7).

Discussion

To the best of our knowledge, this is the first study to evaluate the information and the progress regarding acute stroke recognition available on YouTube, and especially when we look at the developments in social media, we think that this awareness should gradually increase. The findings of this study have to be seen in light of some

Table 6 Comparison of GQS with video contents (Mann-Whitney U test[1], Kruskal Wallis test[2]. Same letters show the significant difference for pairwise comparisons $p < 0.016$ Bonferroni correction)

		GQS_Mean Mean±SD	p
Balance	Not included	2,37±1,26	<0,001[1]
	Included	3,82±0,9	
Eyes	Not included	2,1±1,14	<0,001[1]
	Included	3,82±0,87	
Face	Not included	1,5±0,67	<0,001[1]
	Included	3,76±0,82	
Arms	Not included	1,32±0,52	<0,001[1]
	Included	3,47±1,06	
Speech	Not included	1,5±0,72	<0,001[1]
	Included	3,58±1,01	
Time	Not included	1,6±0,85	<0,001[1]
	Included	3,61±0,97	
Treatment	Not included	2,59±1,39[a]	0,014[2]
	Basic	3,4±1,09[a]	
	Advanced	3,25±1,51	
FAST	Not included	2,42±1,21	<0,001[1]
	Included	3,97±0,89	
BE-FAST	Not included	2,81±1,29	0,002[1]
	Included	4,23±0,98	
TPA	Not included	2,61±1,37	<0,001[1]
	Included	3,64±0,92	
Target Group	Professions	2,3±1,53	0,301[2]
	Patients	3,04±1,29	
	Both	2,75±1,66	
Medical terminology	Not included	3,1±1,27	0,012
	Included	2,04±1,35	

Table 7 GQS scores of searches

GQS mean		N	%	p
2023	<3,5	48	46,2	0,875
	≥3,5	56	53,8	
2021	<3,5	41	45,1	
	≥3,5	50	54,9	

limitations about searching enough videos, but we aimed to include nearly all of the videos which patients can reach during their searches.

As a result of the first data scanned in 2021, we realized that the YouTube platform is not sufficient for increasing public recognition of acute ishemic stroke and immediately engaging in appropriate treatment. The majority of the videos mentioned some clinical findings of ischemic stroke, but the number of contents covering all components of the critically important BE-FAST tool was very low. Parts such as anatomy, etiology, radiology, and pathology were mostly discussed. However, in our opinion, because there are not enough videos that increase awareness of the critical importance of emergency care for patients immediately upon recognizing acute stroke

symptoms, we concluded that YouTube is not a successful enough platform for increasing acute stroke recognition and engaging immediate emergency care. Considering the rapid change process in social media, we wanted to observe how much these data can change over time. Therefore, after approximately 2 years (May 2023), we scanned YouTube again. Although there was an increase in the rate of videos containing BE-FAST, we still believed YouTube was not a successful platform for acute stroke recognition.

As in our study, in a study published in 2020, 150 videos were scanned to determine whether patients could obtain sufficient information about stroke from YouTube, and 101 videos that met the criteria were analyzed [14]. They found that the overall video quality and accuracy of stroke videos was fair, and YouTube was determined a useful source of information for patients to gain knowledge about stroke. Although the average quality of the total videos was below the standard level, our results were better than the results in this study. While eight8 of 101 videos in Szmuda et al.'s study were found to be of good quality, 50 of 91 videos (54.9%) in our 2021 search, and 56 of 104 videos (53.8%) in our 2023 search were above average quality (GQS > 3.5). In fact, this rate was even higher (59.1%) among newly added videos in the recent scan.

The factors that increased video quality were the mention of FAST or BE-FAST content, treatment, tPA, and medical terminology. A longer video duration appears to create a disadvantage in explaining an emergency such as acute stroke and reduced the video quality. Even there was not a statistical difference between two searches, the median length of the videos in 2023 search were shorter than 2021's and total video numbers with duration shorter than 5 min were higher in 2023 search, which shows a tendency of people to watch shorter videos. Whether the video content creator was a professional healthcare team, or a patient or a patient's relative, did not affect quality. Mentioning etiology, pathology, anatomy, radiology, or using animation were among the other factors that did not affect the GQS score.

One of our biggest goals in this study was to determine how popular the BE-FAST tool, now widely used in acute stroke, is on YouTube and thus how quickly and accurately patients are guided. Although the BE-FAST usage rate was far below our expectations (4.4% in 2021, 10.6% in 2023), it was encouraging that this rate more than doubled in 2 years. As it is known from the BE-FAST study published by Ammar et al. in 2020, increasing the rate of diagnosis and treatment of stroke in the acute period provides better results in terms of morbidity and mortality [15]. BE-FAST's sensitivity for stroke is 91% and its specificity is 56% [16].

With this study, in which we investigate whether video contents that will reach these highly sensitive values are conveyed correctly to society, we conclude that YouTube is not yet useful enough, though has made positive progress with the developing use of social media for healthcare information and education.

Declarations

Ethics approval and consent to participate
This research does not involve human subjects, human material, or human data. Local ethics committee (Ethics Committee of Acıbadem University Medical Faculty) ruled that no formal ethics approval was required in this particular case.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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