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EVALUATION OF QUALITY AND RELIABILITY OF YOUTUBE EDUCATIONAL BRONCHOSCOPY VIDEOS

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ABSTRACT

Objective: *YouTube videos are used frequently in almost every field of medical education. This study aimed to examine the content, popularity, and quality of bronchoscopy videos published on YouTube.* ***Methods:*** *We searched YouTube videos by using 'bronchoscopy' and other keywords that can be used synonymously on 18.04.2022. We sorted the videos according to view count, and the examined videos had more than 5000 views for each keyword. The view counts, like, and dislike numbers, duration of videos, source, and video content were recorded. We used the video popularity index to determine the popularity and DISCERN, and the global quality score for quality and reliability.* ***Results:*** *We reviewed the remaining 202 videos after excluding duplicate videos and those that met the exclusion criteria. The most common procedure type was fiberoptic bronchoscopy (FOB) (69.8%) and the most common content was viewing airways (46.0%). Most videos (92.7%) were uploaded by health professionals. The median VPI was 0.08 (IQR: 0.03-0.21), and median DISCERN and GQS were 45.0 (IQR: 30.0-64.3) and 3.0 (IQR: 2.8-4.0), respectively. There was a strong correlation between the GQS and DISCERN ($r=0.83$, $p<0.001$). In terms of quality and reliability, videos uploaded by professional associations had a higher GQS ($p=0.04$) and DISCERN ($p=0.03$) than those by non-medical sources.* ***Conclusion:*** *This study showed that most bronchoscopy videos on YouTube were uploaded by healthcare professionals and targeted other healthcare professionals. The lack of a strong relationship between popularity, quality, and safety is not reassuring for the use of these videos in education.*

Keywords: *Bronchoscopy, Medical Education; Video; Quality.*

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INTRODUCTION

YouTube, the largest and most used video-sharing platform, allows users to share and watch videos. Since likes, dislikes, comments, and view counts may be indicated, it also helps to learn the audience's reactions and guide new viewers. It has become one of the most commonly used information-sharing platforms, with over 122 million active daily users and over 1 billion watched videos per day [1, 2]. It is currently a site that people use not only for fun but also to obtain information about the subject they are curious about. Many educational institutions use YouTube as an educational platform through their official YouTube channels because of the advantages of repeatedly watching videos, uploading more than one video on the same subject where different training methods can be used, and low cost. During the Coronavirus Disease 2019 (COVID-19) period, when face-to-face education was disrupted, YouTube became much more critical.

Since its first use by Gustav Killian, bronchoscopy has become one of the most important diagnostic tools in pulmonary medicine [3-5]. Although its first use started with rigid bronchoscopy, technological developments have introduced new and different devices such as fiberoptic and navigation bronchoscopy, endobronchial ultrasonography, and robotic bronchoscopy in the field of pulmonary medicine [5-7]. They are frequently used in diagnosing and treating airways, mediastinum, and parenchymal lung diseases; thus a new field of study called 'interventional pulmonology' was introduced.

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With the widespread use of the Internet, many medical videos have been published on YouTube and other video-sharing sites. Many residents and medical students watch educational videos. Surgeons even watch videos of surgery before starting the operation [8, 9]. The satisfaction rates of viewers for videos prepared for medical education differ between studies [10, 11]. While videos containing theoretical information, are found educationally useful [12, 13], those including practical information, such as surgical procedures, were not found sufficient in terms of education [14, 15]. Learning bronchoscopy is similar to learning surgery. It is not sufficient to have anatomical and theoretical knowledge; getting this training from experienced hands and working with them is necessary for effective learning [7].

The increase in the number of residents, lack of appropriate environment and medical devices in every clinic, and increasing economic pressure affecting the need for maximum efficiency in medical procedures disrupted bronchoscopy training. With the outbreak of COVID-19, an airborne disease, the number of bronchoscopic procedures performed has decreased considerably, especially in the early stages of the pandemic. Many organizations have issued opinions regarding postponing non-urgent and non-essential initiatives [16]. This has resulted in the disruption of hands-on training in interventional pulmonology procedures.

We aimed to determine the diversity, content, and characteristics of bronchoscopy videos published on YouTube and to evaluate their popularity, quality, and reliability. We present the following article in accordance with the CONSORT reporting checklist.

MATERIALS & METHODS

Video search

First, we identified the terms used as synonyms for bronchoscopy for more comprehensive research. We searched videos on YouTube using the terms 'bronchoscopy', 'bronchoscope', 'fiber bronchoscopy' (FOB), 'fiber bronchoscope', 'fiberoptic bronchoscopy', fiberoptic bronchoscope 'rigid bronchoscopy', 'rigid bronchoscope', 'bronchofiberoscopy', 'bronchofiberoscope', 'endobronchial ultrasound' (EBUS), and 'EBUS'. We collected all data on the same day as the number of views and likes may change (18.04.2022). After sorting the videos according to the number of views, we included videos with more than 5000 views for each term. We then excluded the duplicated videos. We eliminated videos related to animal bronchoscopies. Videos in non-English languages were excluded. We recorded the view counts, like, and dislike numbers, duration of videos, date of upload, source (real person or institution), and video content. Video content was determined by viewing the airways with FOB, foreign body removal, biopsy, conventional transbronchial needle aspiration (c-TBNA), and endobronchial ultrasound (EBUS)-TBNA. We also categorised the videos according to the object used (real person, mock-up, animation, or combined). The target audience of the video (patients or health professionals) was also recorded. We recorded the sex, academic degree, and specifications if the source was a person.

Popularity analysis

Video popularity was analysed using a previously defined scoring system: the video power index (VPI). The formula was calculated as follows: (like ratio)/view ratio)/100. The like ratio means like number/ (like number + dislike number), and the view ratio means views per day. A higher score on the VPI indicates higher popularity.

Quality and reliability

We assessed the quality of the videos using the DISCERN instrument score and global quality scoring system (GQS). The DISCERN scoring system is a tool created to measure the quality and reliability of content regarding health and treatment methods, most of which are obtained from the Internet and whose accuracy, quality, and source are unclear. It consists of 16 questions, including three groups of questions examining reliability, informativeness, and overall quality. Each question is scored out of five points, with 1 representing definitely 'no' and 5 representing definitely 'yes'[17]. The GQS is another scoring system that tests overall quality and usability. In this tool, each piece of content is evaluated over five points; one point indicates low information content, low usefulness, and poor quality, and five points indicate high information content, high usefulness, and high quality[(18)]. In this study, each video was evaluated by a pulmonologist and thoracic surgeon using these two scoring tools, and the mean of the two was recorded as the final score.

Statistical analysis

We used the Statistical Package for the Social Sciences 24.0 (Armonk, NY: IBM Corp.) to analyse the data. Variables were evaluated by analytical (Kolmogorov–Smirnov/Shapiro–Wilk test), and visual methods (histograms, probability plots) were

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used to determine the distribution. Descriptive statistics are presented as frequency, percentage, mean standard deviation (SD), and median interquartile range (IQR). The Kruskal–Wallis and Mann–Whitney U tests were used for continuous variables and the chi-square test for categorical variables. Associations between non-parametric variables were assessed using Spearman's test. Bonferroni correction was used for post hoc analysis. Statistical significance was set at $p < 0.05$. The statistical significance level for the Bonferroni correction was $p<0.017$ (0.05/3) and $p-< 0.0083$ (0.05/4).

RESULTS

By searching using the keywords above, we obtained 442 videos. After excluding 191 repetitions, 28 irrelevant, 13 veterinaries, and eight non-English videos, we sampled 202 videos. The most common procedure type was FOB (69.8%), followed by EBUS (15.3%) and rigid bronchoscopy (14.9%). Most of the videos consisted of FOB videos reviewing the basal airway structure (46.0%) and device demonstrations (29.7%). Most videos included real patient images (62.4%); the rest consisted of animations (24.3%), educational mock-ups, and combinations. Health professionals were the target audience in four-fifths of the sample. The median duration of videos was 4.27 (IQR: 1.55–7.69) min. The videos were viewed 11.625.295 times and liked 45064 times overall. The median duration after uploading was 75.3 (IQR: 48.4–126.6) months, and 87.7% of the videos were uploaded before the first day of the pandemic (11.03.2020) (**Table 1**)

Table 1. Features of videos and uploaders

Uploader (N=202)	N (%)
Type of uploader	
Individual	82 (40.6)
Professional association	22 (10.9)
Commercial company	32 (15.8)
Educational institution/hospital	66 (32.7)
Specification (N=82)	
Pulmonologist	45 (54.9)
Thoracic surgeon	9 (11.0)
Other disciplines	22 (26.8)
Non-medical	6 (7.3)
Academic degree (N=76)	
Professor	46 (60.5)
Attending physician	26 (34.2)
Resident	4 (5.3)
Gender (Male, %) (N=82)	77 (93.9)
Subscriber count, median (IQR)	10250 (679-21800)
Video N=202	
Video content	
Viewing airways with FOB	93 (46.0)
Device presentation	60 (29.7%)
EBUS- TBNA	25 (12.4%)
Foreign body removal	11 (5.4)
Biopsy	8 (4.0)
Conventional- TBNA	5 (2.5)
Used material	
Real patient	126 (62.4)
Animation	49 (24.3)
Education mock-up	17 (8.4)
Combined	10 (5)
Targeted Audience	
Health professionals	166 (82.2)
Patients	36 (17.8)
Duration, median (IQR) (minutes)	4.27 (1.55-7.69)
Publication duration, median (IQR) (months)	75.3 (48.4-126.6)
View count, median (IQR)	14712 (8077-39126)
Like count, median (IQR)	47 (14-178)
View ratio, median (IQR)	7.95 (3.41-21.36)
VPI, median (IQR)	0.08 (0.03-0.21)
DISCERN, median (IQR)	45.0 (30.0-64.3)
GQS, median (IQR)	3.0 (2.8-4.0)

FOB: Fiberoptic bronchoscopy, EBUS: Endobronchial ultrasonography, TBNA: Transbronchial needle aspiration, GQS: Global quality score, VPI: Video power index, IQR: Interquartile range

Research has revealed that most of the videos were uploaded by individuals (40.6%) and educational institutions/hospitals (32.7%). Healthcare professionals uploaded 92.7% of the videos, and more than half were pulmonologists (54.9%). The total number of subscribers for all uploaders was 5,340,612. Among the healthcare professionals, 60.5% of the uploaders were professors and 34.2% were attending physicians. There was male dominance in individual uploaders (93.9%).

While the median VPI was 0.08 (IQR: 0.03–0.21), the median DISCERN and GQS were 45.0 (IQR: 30.0–64.3) and 3.0 (IQR: 2.8–4.0), respectively. GQS was strongly positively correlated with DISCERN and weakly positively correlated with VPI ($r=0.83$, $p<0.001$), ($r=0.24$, $p<0.001$), respectively). In terms of quality and reliability, videos uploaded by professional associations had a higher GQS ($p=0.04$) and DISCERN ($p=0.03$), but not VPI ($p=0.4$) (**Table 2**) than those by non-medical sources. Pulmonologists' videos had higher scores than those uploaded by non-medical sources for all three scores. There was no difference in scores according to an academic degree (**Table 3**).

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Table 2. Correlation analysis between quality, reliability, and popularity scores

	DISCERN	VPI
DISCERN		
Correlation coefficient	-	0.14
p	-	0.05
GQS		
Correlation coefficient	0.83	0.24
p	<0.001	0.001

GQS: Global quality score, VPI: Video power index

Table 3. Comparison of uploaders according to quality, reliability, and popularity

	DISCERN	p	GQS	p	VPI	p
Uploader (N:202)		0.03[a]		0.04[b]		0.4
Individual	42.5 (27.8-60.5)		3.0 (2.0-4.0)		0.07 (0.03-0.20)	
Professional association	68.0 (43.5-72.0)		4.0 (3.0-5.0)		0.09 (0.04-0.15)	
Commercial company	45.0 (31.0-66.0)		3.0 (3.0-4.0)		0.09 (0.04-0.26)	
Educational institution/hospital	41.0 (29.5-56.5)		3.0 (2.0-4.0)		0.11 (0.03-0.29)	
Individual (N:82)		0.001[c]		0.004[c]		0.01[d]
Pulmonologist	53.0 (38.0-68.0)		3.0 (3.0-5.0)		0.05 (0.03-0.14)	
Thoracic surgeon	38.0 (23.0-46.0)		2.0 (2.0-3.5)		0.24 (0.18-0.31)	
Other discipline	39.5 (19.8-53.5)		3.0 (2.0-4.0)		0.07 (0.02-0.17)	
Non-medical	17.0 (15.0-30.0)		2.0 (1.0-2.3)		0.13 (0.03-0.26)	
Academic degree N:82)		0.26		0.84		0.04[e]
Professor	50.0 (36.0-68.0)		3.0 (3.0-5,0)		0.05 (0.02-0.16)	
Attending physician	40.0 (20.0-55.3)		3.0 (2.0-4.0)		0.07 (0.04-0.15)	
Resident	38.0 (22.0-67.5)		3.0 (2.3-4.5)		0.22 (0.17-0.27)	

GQS: Global quality score, VPI: Video power index

a Bonferonni test, significance between professional association and individual, professional association and educational institution/hospital, p<0.0083 ; b Bonferonni test, significance between professional association and individual, p<0.0083 ; c Bonferonni test, significance between pulmonologist and non-medical, p<0.0083 ; d Bonferonni test, significance between pulmonologist and chest surgeon, p<0.0083; e Bonferonni test, no significance, p<0.017

DISCUSSION

This study showed that there are numerous videos of bronchoscopy-related procedures targeting both health care professionals and patients. Although most videos consisted of real patient images, mock-up videos and animations were also available. Most videos were uploaded by healthcare professionals, primarily pulmonologists. Videos uploaded by professional associations and pulmonologists had higher quality and reliability scores than those by non-medical sources.

Invasive procedure education, from minimally invasive interventions to major surgeries, requires dedicated master-apprentice education[(19)]. However, adequate training cannot be provided in every educational institution because of the insufficient competence of trainers and the lack of sufficient time and space opportunities. Stein et al.[(20)] reported that less than half of the residents in colorectal surgery training performed fewer than 10 colectomies, which was far from the minimum number of 50 cases suggested by the American Board of Colon and Rectal Surgery[(21)]. The residents attempt to overcome the lack of sufficient training by watching YouTube videos [8, 22, 23]. Similarly, hands-on bronchoscopy training-like surgeries cannot be performed in sufficient time and numbers in all clinics. Our study showed that most videos uploaded to YouTube targeted health professionals (82.2%). FOB videos accounted for 69.8% of all videos, including the view of the airways (46.0%) and device presentations (29.7%), but not advanced bronchoscopic procedures, such as EBUS or rigid bronchoscopy. Approximately two-thirds of the videos contained real patient images. These findings demonstrated that doctors in pulmonary and thoracic surgery residency watched bronchoscopy videos on the Internet, even in basal education.

This study showed that health-related individuals or institutions uploaded 84.2% of videos. Similarly, most uploaders were healthcare professionals (92.7%). Similar to our findings, most video uploaders in most studies were health-related individuals and institutions [(24, 25)]. Additionally, 60.5% of the individual uploaders in our study were professors, who were also responsible for the

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education of residents and medical students. Health-related individuals and institutions may publish videos to increase their social media recognition or to compensate for the lack of education. However, given that most of the videos targeted healthcare professionals, the concern to compensate for the education gap was outweighed. Moreover, De Angelis, in his study evaluating laparoscopic appendectomy videos, reported that the novice trainees benefited from the videos more than the senior surgeons [26].

To determine the quality and reliability of the videos, DISCERN and GQS were used. Our results showed that professional associations had higher DISCERN scores from individuals and medical institutions and higher GQS scores from individuals. There was no difference in VPI scores among the uploaders. Among the individuals, pulmonologists had higher DISCERN and GQS scores than non-medical uploaders. There were no significant differences in the three scores according to academic degrees. The higher DISCERN and GQS of professional associations can be elucidated by the fact that the primary purpose of these institutions is education, and they have prepared more professional videos.

Similarly, the fact that pulmonologists have uploaded higher quality and more reliable videos than non-medical professionals may also be related to educational concerns. Jamleh et al. stated that the periradicular surgery videos they examined had a low usefulness score, which may be because most of the videos were uploaded by individuals rather than professional organisations [25]. Similarly, in a study examining thyroid surgery, videos from academic institutions had higher quality and reliability [24]. In contrast to our findings, physiotherapists' (the medical professionals in our study) videos were of higher quality than health-related websites and academic institutes/university hospitals' videos[27]. In our opinion, this finding is unique to this study and may be related to the fact that in daily practice, physiotherapists deal with patients quite closely and have the ability to teach them specific exercises.

In the current study, the quality and reliability scores, DISCERN and GQS, were strongly correlated with each other but not with VPI. Various studies have confirmed that data showing popularity, such as the number of likes, number of views, or VPI, are not indicative of quality and safety [24, 27, 28]. This is owing to popularity being related to random audiences' clicking 'like' or 'dislike' while quality and reliability are specified by the experts.

Although its use is increasing daily, YouTube videos do not appear to be a good source because neither do they pass the peer-review process nor do they have to cite the source[(24, 25, 29)]. As aforementioned, this is more prominent in interventional procedures including bronchoscopy. In their randomised controlled study, Karim et al. divided medical students into three groups: traditional instructor-led, standardised video-watching, and YouTube video-watching groups. They stated that the group that received training from the instructor learned significantly better than those who watched video [19].

The main limitation of our study was that we could not compare the pre-and post-pandemic periods, as we could not review the number of views according to date. Sorting the videos by the number of views and accepting 5000 as the limit may have caused exclusion of some higher-quality videos. Although YouTube is the most broad-based video-sharing site, using only YouTube videos in the study may have overlooked others published on other sites.

The high number of videos reviewed, categorisation of both uploaders and videos, and evaluation of their quality and reliability by both pulmonologists and thoracic surgeons are the strengths of our study.

CONCLUSIONS

Videos published on YouTube or other channels are increasingly being used in bronchoscopy education, as in almost every field of medicine. However, there are still handicaps owing to low video quality and reliability, lack of a peer-review process, reliable references, and the need for master-led education in practical bronchoscopy training. Better quality videos may contribute to learning airway anatomy; however, bronchoscopy training should be performed with hands-on supervision by a master.

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