JBACHS
Journal of Basic and Clinical Health Sciences

J Basic Clin Health Sci 2019; 3:134-138
https://doi.org/10.30621/jbachs.2019.645

Original investigation

Assessment of the Educational Content of YouTube Videos about Chest Radiograph Interpretation

Canan Gündüz[1], Okan Gürkan[2]

[1]Biruni University Hospital, Pulmonary Diseases, İstanbul, Turkey
[2]Taksim Research and Training Hospital, Radiology, İstanbul, Turkey

Address for Correspondence: Canan Gündüz, **E-mail:** canangunduz@yahoo.com
Received: 09.05.2019; **Accepted:** 29.07.2019; **Available Online Date:** 30.09.2019

Cite this article as: Gündüz C, Gürkan O. Assessment of the Educational Content of YouTube Videos about Chest Radiograph Interpretation J Basic Clin Health Sci 2019; 3:134-138.

ABSTRACT

Objectives: YouTube has become a commonly used education tool by medical students; however, the quality of the content varies and unreliable videos may be misleading. The aim of the present study was to evaluate the educational content of YouTube videos about chest radiograph interpretation.

Patients and Methods: A search was made using the keywords "chest radiograph/chest x ray interpretation". Video characteristics and video content indices (content quality index [CQI], PACEMAN index and video information and quality index [VIQI]) were evaluated by two reviewers. Spearman correlation analysis and Mann Whitney U tests were performed.

Results: In the study, 34 videos with a median of 11.34 (1.52-51.18) minutes were evaluated. The median scores for CPI, PACEMAN, VIQI and VPI were 9.00 (3.00-12.00); 14.50 (9.00-20.00); 4.00 (0.00-7.00) and 17.45 (0.08-803.61), respectively. CPI demonstrated a correlation with VIQI and PACEMAN scores (<0.001). A significant difference between PACEMAN (U=60.00, p=0.003) scores and a borderline significant difference between VIQI (U=87.50, p=0.050) scores were reported between low and high content quality groups. The characteristics of videos did not differ between two groups. Besides technical details, the evaluation of hila, pleura, the area below diaphragm, hidden areas and soft tissues were significantly lower in low content group. No standard method was used by instructors during interpretation.

Conclusion: Videos assessing chest radiograph interpretation had a variety of content quality, did not follow a standardized method and certain aspects were significantly missed in videos with low content. Professional organizations should be creating multimedia content to prevent misleading of medical students.

Keywords: YouTube, medical education, thoracic radiography, X Ray film

INTRODUCTION

Chest radiograph is an important diagnostic tool that is commonly used virtually in all levels of healthcare facilities by physicians from a variety of specialties. Nonetheless, the accurate interpretation of chest radiograph requires evaluation of numerous facts. Although there is not a particular standard method superior to alternatives, a systematic approach to radiological interpretation is described to be of profound importance, especially for physicians in training (1). Thus, interpretation of chest radiograph may be a challenging process for the junior physicians as well as the medical students. Consequently, internet resources in medical education may be frequently sought by the students (2). Students may particularly prefer multimedia educational tools for procedures that require learning and practicing visual skills like chest radiograph interpretation.

YouTube is the world's largest media-sharing site, is visited by over 1.9 billion users per month and is watched for 1 billion hours per day (3). YouTube has also become an important and a practical medical education tool for medical students as it can be accessed by mobile devices regardless of time or place (4, 5). On the other hand, despite the beneficial effects of useful YouTube videos; the inaccurate content may be misleading for the students (6). The inaccurate, insufficient and misleading content of YouTube videos regarding certain surgical procedures or medical education has been emphasized by a number of studies (7, 8).

Videos regarding posterior-anterior chest radiograph interpretation can be found in YouTube and are potentially important educational material for medical students willing to improve and practice their skills. However, the content and the quality of the videos regarding chest radiograph interpretation has not been previously examined. The aim of the present study was to evaluate the educational content of YouTube videos about chest radiograph interpretation.

MATERIALS AND METHODS

Search strategy, inclusion and exclusion criteria

The present study had a cross-sectional design. The Google Trends application was used for determining the most commonly used search terms in previous 5 years regarding the subject of the present study. "Chest radiograph" and "chest x ray" were defined as the most common terminologies in regards to imaging of chest by x ray (Google Trends, 2019).

A search was made using the keywords "chest radiograph interpretation "and "chest x ray interpretation" in the online video streaming Web site YouTube® (https://www. YouTube. com) on April 4–5, 2019, to assess the information on chest radiograph interpretation. During search, the default filter "sort by relevance" was used. In the study, the search results were limited to the first 200 videos. A playlist of reviewed videos were saved in a playlist in order to prevent possible changes in the search results on different days. All videos were evaluated by two reviewers and their interrater reliability was examined. One of the reviewers was a radiologist and the other one was a physician in pulmonary diseases. Multipart videos, recurrent videos, silent and non-English videos were not included in the study.

The source locators (URLs) of the videos were recorded in the database file as well. Video sources were categorized into four groups, as follows: "academic health institution", "individual" "for-profit health organization" and "non-profit health organization". The characteristics of the videos such as video length, number of likes, dislikes and comments and time elapsed since upload date were recorded.

Assessment of quality content

The content of the videos were assessed through 3 separate indices: Content quality index, PACEMAN index, video information and quality index (VIQI). The content quality index was derived from the evaluation criteria recommended by Murfitt (9). The content quality of the videos were examined according to the following elements: 1) name and date, 2) technique, 3) trachea, 4) heart and mediastinum, 5) hila, 6) pleura, 7) lung fields, 8) diaphragms, 9) area below diaphragm, 10) hidden areas, 11) soft tissue and 12) bones. PACEMAN index (10) was used for reviewing the technical assessment according to following factors: 1) position, 2) area, 3) collimation, 4) exposure, 5) markings (left/right), 6) aesthetic view, 7) name. Each element evaluated in the video was scored as 1 point and the possible total score was 12 points for content score and 7 points for PACEMAN score. Videos having a score less than the median content score were scored as `low content'. Furthermore, VIQI was used for evaluating the overall quality of the video through following elements: 1) flow of information, 2) information accuracy, 3) quality (one point each for use of still images, animation, interview with individuals in the community, video captions, and a report summary), and 4) precision (level of coherence between video title and content). Each component of VIQI score was assessed using a 5-point Likert scale ranging from 1 (poor quality) to 5 (high quality).

The following formulas were used to determine the popularity of the videos: the view ratio (number of views/number of days since upload), like ratio (number of likes X100/number of likes + number of dislikes), and video power index (VPI) (like ratio X view ratio/100).

Ethics committee approval was not required for the current study since public data was assessed.

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics 22.0 (Armonk, NY, USA: IBM Corp.). The normality of the distributions of variables were assessed by Shapiro-Wilk test. Spearman correlation analysis was performed to examine possible correlations of total content score with VIQI score, PACEMAN score, VPI and video characteristics. Videos scored as 9 points or more were considered high content, and the remaining as low content. Mann-Whitney U test was used to compare the features and scores of high and low content groups. For all analysis, a *P* value <0.05 was considered significant.

RESULTS

The search terms "chest radiograph interpretation" and "chest x ray interpretation" were used and the first 200 videos for each term were examined. The majority (n=188) of the videos resulting from both search terms were in common. Thirty-four videos were included in the study after the exclusion of non-English videos (n=6), videos there were parts from multipart series (n=32), pediatric radiology videos (n=4), videos with non-appropriate/non-educational content (evaluation of specific diseases or an individual patient) (n=125), videos with no audio (n=3). Individual users were the prominent sources of upload (41.2%) followed by non-profit health organizations (35.3%), for-profit health organizations (17.6%) and academic health institutes (5.9%) (Table 1). The instructors in the videos were

Table 1. Characteristics of the YouTube videos (n=34)

	Mean ± SD	Median (IQR)
Length of video (min)	15.95±13.61	11.34 (1.52–51.18)
Number of views	100195.15±184310.22	8451.50 (44.00–597780.00)
Number of likes	875.65±1691.47	146.00 (0.00–6700.00)
Number of dislikes	27.44±51.50	2.00 (0.00–229.00)
Number of comments	28.76±57.18	11.00 (0.00–294.00)
Time elapsed since upload date (days)	1119.12±950.80	764.00 (23.00–3443.00)
Content score (12 pts)	8.49±2.61	9.00 (3.00–12.00)
PACEMAN score (7 pts)	3.26±2.14	4.00 (0.00–7.00)
VPI	77.32±156.80	17.45 (0.08–803.61)
VIQI score (20 pts)	14.68±3.23	14.50 (9.00–20.00)
Flow of information	3.65±1.07	4.00 (1.00–5.00)
Information accuracy	3.79±0.77	4.00 (2.00–5.00)
Quality	3.21±1.30	3.00 (1.00–5.00)
Precision	4.00±1.10	4.00 (1.00–5.00)
Source of upload		
Academic health institution	n (%)	2 (5.9%)
Individual	n (%)	14 (41.2%)
For-profit health organization	n (%)	6 (17.6%)
Non-profit health organization	n (%)	12 (35.3%)

VPI: video power index; **VIQI:** video information and quality index.

Table 2. Ratios of evaluated components of the content quality score and PACEMAN index

Content quality score components		
	N	**%**
Name and date	16	47.1
Technique	19	55.9
Trachea	26	76.5
Heart and mediastinum	31	91.2
Hila	27	79.4
Pleura	29	85.3
Lung fields	32	94.1
Diaphragm	32	94.1
Area below diaphragm	25	73.5
Hidden areas	8	23.5
Soft tissue	15	44.1
Bones	26	76.5
PACEMAN index components		
	N	%
Position	24	70.6
Area	21	61.8
Collimation	9	26.5
Exposure	21	61.8
Markings (Right/Left)	11	32.4
Aesthetic view	10	29.4
Name	16	47.1

Table 3. Correlation analysis of content quality score

	Correlation coefficient	**p-value**
Length of video (min)	0.073	0.680
Time elapsed since upload date (days)	-0.072	0.684
Number of views	0.034	0.849
Number of likes	0.102	0.566
Number of dislikes	0.116	0.513
Number of comments	0.030	0.868
PACEMAN index	0.618	<0.001
VIQI score	0.635	<0.001
Flow of information	0.450	0.008
Information accuracy	0.535	0.001
Quality	0.329	0.058
Precision	0.647	<0.001
VPI score	0.169	0.339

VPI: video power index; **VIQI:** video information and quality index

radiologists (n=9), medical students (n=5), physicians in internal medicine (n=3), emergency medicine (n=3), anesthesiology (n=2), pulmonary medicine (n=2) and nurses (n=2). In 8 videos, no information regarding the occupation/specialty of the instructor was reported.

The characteristics of the videos included in the present study has been described in Table 1. The median (IQR) length of the videos was 11.34 (1.52–51.18) minutes. The median (IQR) number of views was 8451.50 (44–597780) and number of likes was 146 (0–6700). The median (IQR) values for content score was 9.00 (3.00–12.00), for VIQI score was 14.50 (9.00–20.00) and for VPI score was 17.45 (0.08–803.61). The median value for PACEMAN score was 4.00 (0.00–7.00). Interclass correlation coefficients ranged between 0.927 and 0.970 for intra-rater reliability and from 0.911 and 0.936 for interrater reliability.

Table 4. Comparison of variables according to low (n=16) and high (n=18) content

	Mann-Whitney U	**Z**	**P value**
Characteristics of videos			
Length of video (min)	132.00	-0.41	0.679
Time elapsed since upload date (days)	127.00	-0.58	0.558
Number of views	119.00	-0.86	0.388
Number of likes	116.00	-0.97	0.334
Number of dislikes	102.50	-1.47	0.143
Number of comments	127.50	-0.57	0.566
Content quality scores			
PACEMAN score	60.00	-2.98	0.003
Position	71.00	-3.19	0.001
Area	95.00	-2.01	0.045
Exposure	95.00	-2.01	0.045
Aesthetic view	98.00	-2.01	0.044
Name	67.00	-3.07	0.002
Content score			
Name	67.00	-3.07	0.002
Technique	63.00	-3.12	0.002
Hila	98.00	-2.26	0.023
Pleura	99.00	-2.53	0.011
Area below diaphragm	80.00	-2.89	0.004
Hidden areas	80.00	-3.00	0.003
Soft tissue	75.00	-2.77	0.006
VIQI score	87.50	-1.96	0.050
Information accuracy	86.50	-2.14	0.032
Precision	59.50	-3.08	0.002
VPI	113.00	-1.07	0.285

VPI: video power index; **VIQI:** video interpretation and quality index.

In the detailed evaluation of the content components, lowest scores were observed for the evaluation of hidden lung areas, soft tissue, technical details and patient information (Table 2). Among PACEMAN index components, collimation, aesthetic view and markings had the lowest scores (Table 2).

In the correlation analysis of content score, significant correlations for VIQI and PACEMAN index were reported. There was no correlation between content score and VPI (Table 3).

In the comparison of low and high content quality groups, a statistically significant difference between PACEMAN (U=60.00, p=0.003) scores and a borderline significant difference between VIQI (U=87.50, p=0.050) scores were reported. The characteristics of videos did not differ between two groups. Among headings of the content score; besides technical details, the evaluation of hila, pleura, the area below diaphragm, hidden areas and soft tissues were significantly lower in low content group (Table 4).

DISCUSSION

Medical students and physicians at the beginning of their careers prefer YouTube as an education tool for learning chest radiograph interpretation due to audiovisual content instead of scientific platforms (4, 5). Our study displayed that the content and the quality of the videos vary, the instructors do not follow a standard approach and the information may be inaccurate or incomplete. The videos with low content quality were significantly incomplete regarding technical details as well as certain specific evaluation criteria. The content score demonstrated a correlation with VIQI and PACEMAN indices. Video characteristics such as number of likes, dislikes or comments were not associated with content score.

Chest radiograph is an important diagnostic tool that every medical school graduate is expected to be capable of evaluating. On the other hand, students frequently find chest radiograph interpretation difficult and it can be challenging even for senior radiology residents (1,10). One important reason for this, is the absence of a standard method recommended for chest radiograph interpretation. Some health professionals evaluate the chest x-ray starting from the central regions and proceed towards peripheral region. On the contrary, some physicians prefer starting from the peripheral areas and proceed towards central region. There is also ABCDE systematic evaluation method that is commonly used for medical students. In this method, in most of the sources, A stands for airway, B for bones, C for cardiovascular, D for diaphragms and E for effusion. Although no evaluation method is proven to be superior to other, the content is expected to be containing the following criteria (9): 1) request form details, 2) technical details, 3) trachea, 4) heart and mediastinum, 5) diaphragms, 6) pleura, 7) lung fields, 8) hidden areas, 9) hila, 10) below diaphragms, 11) soft tissues and 12) bones. Incomplete scoring of each element was associated with low content. In the majority of the videos, the rates of the examination of area below diaphragm and soft tissues were lower compared to other elements. Technical details are expected to be comprised of elements such as centering, patient position and markers (left/right). Technical components of chest radiograph are stated in PACEMAN index in details. In most of the videos examined in the present study, alphabetic ABCDE method was used. However, expansion of ABCDE abbreviation varied between sources and in some cases, the letters extended in the alphabetic order. Technical components were not examined in detail as recommended by PACEMAN index. Although the instructors in the videos were all health professionals depending on our study subject, only a few videos fulfilled all of the criteria of the indices. The quality of the audiovisual content and the comprehensibility of the instructors' also varied between different sources. Thus, medical students practicing posterior-anterior chest x-ray interpretation skills from YouTube may end up with different, inaccurate and misleading information. Besides, the titles of the videos screened were not precise and inappropriate contents were encountered in most of the videos. Although 200 videos for each search term were screened in our study, only 34 videos could be included in the study for scoring. Similarly, in a study evaluating the quality assessment of cardiac auscultation material on YouTube, only 22 videos have been considered suitable for scoring out of filtered 139 videos from 3350 videos in total (8). In conclusion, although YouTube is defined as a practical way of attaining information; reaching the determined content may not be invariably simple and the determined content may not be reflecting the accurate information.

The reliability of medical videos has been a major concern for physicians and has been examined by previous studies (11). The benefits of YouTube may transform into harm in case of misinforming patients and giving wrong alarms (12). As the creators and the accuracy of the video contents are not monitored, this risk maintains. In the educational videos having medical students as the target audience, as the instructors become health professionals; the misinformation risk eventually gets lower. On the other hand, the content creators do not always represent experts on the specific subject and may be also be a part of for-profit healthcare organizations. In our study, only two videos were uploaded by academic health institutions. Previous studies have reported the incomplete contents of medical education videos regarding a variety of subjects, diseases, interventions and device uses (7, 8, 13, 14). The present study clearly confirmed the results from the previous studies emphasizing the unreliability and insufficiency of medical education videos in YouTube. Furthermore, the current study was the first study to evaluate the quality content of educational videos about chest radiograph interpretation. Content quality index was derived by the investigators of the study, by using the recommendations of Murfitt (9) and was useful since the total score correlated with VIQI. Using PACEMAN score for assessing technical competence facilitated the realization of the specific deficits in detail. Likewise, examining the components of the content quality index revealed the significant deficits in low content videos such as interpretation of hila, area below diaphragm, pleura, hidden areas and soft tissues.

The small number of search terms used was one of the limitations of the study and could have limited the sample size. Limiting the video content language to English also restricted the content reviewed. On the other hand, the present study is important for being the first study examining the current subject that engages all medical students and practitioners.

In conclusion, the present study examining the educational content of YouTube videos about chest radiograph interpretation revealed that YouTube is not a reliable source and can be misleading for medical students and physicians. Thus, academic institutions and professional societies need to take an action for creating the accurate medical multimedia content addressing the audio-visual learning generation.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - CG, OG; Design - CG, OG; Supervision - CG, OG; Fundings - CG, OG; Materials - CG, OG; Data Collection and/or Processing - CG, OG; Analysis and/or Interpretation - CG, OG; Literature Search - CG, OG; Writing Manuscript - CG, OG; Critical Review - CG, OG

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

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Delrue L, Gosselin R, Ilsen B, Van Landeghem A, de Mey J, Duyck P. Difficulties in the Interpretation of Chest Radiography. Berlin, Heidelberg: Springer; 2011. pp.27–49.
2. Wanner GK, Phillips AW, Papanagnou D. Assessing the use of social media in physician assistant education. Int J Med Educ 2019;10:23–28. [CrossRef]
3. YouTube statistics page. [Internet]. [cited 2019 May 2]. Available at: [CrossRef]
4. Tackett S, Slinn K, Marshall T, Gaglani S, Waldman V, Desai R. Medical Education Videos for the World. Acad Med 2018;93:1150–1156. [CrossRef]
5. Rapp AK, Healy MG, Charlton ME, Keith JN, Rosenbaum ME, Kapadia MR. YouTube is the Most Frequently Used Educational Video Source for Surgical Preparation. J Surg Educ 2016;73:1072–1076. [CrossRef]
6. Rabee R, Najim M, Sherwani Y, et al. YouTube in medical education: a student's perspective Med Educ Online 2015;20:29507. [CrossRef]
7. Lena Y, Dindaroglu F. Lingual orthodontic treatment: A YouTube video analysis. Angle Orthod 2018;88:208–214. [CrossRef]
8. Camm CF, Sunderland N, Camm AJ. A quality assessment of cardiac auscultation material on youtube. Clin Cardiol 2013;36:77–81. [CrossRef]
9. Murfitt J. The normal chest: methods of investigation and differential diagnosis. Oxford: Churchill Livingstone; 1993.
10. Kyei KA, Antwi WK, Atswei LP, Kitson-Mills D, Donkor A. Evaluation of chest radiographs to determine the knowledge of final year Ghanaian radiography students. The South African Radiographer 2018;56:31–34.
11. Madathil KC, Rivera-Rodriguez AJ, Greenstein JS, Gramopadhye AK. Healthcare information on YouTube: A systematic review. Health Informatics J 2015;21:173–194. [CrossRef]
12. Nagpal SJS, Karimianpour A, Mukhija D, Mohan D, Brateanu A. YouTube videos as a source of medical information during the Ebola hemorrhagic fever epidemic. Springerplus 2015;4:457. [CrossRef]
13. Şahin A, Şahin M, Türkçü FM. YouTube as a source of information in retinopathy of prematurity. Ir J Med Sci 2018;188:613–617. [CrossRef]
14. Joshi S, Dimov V. Quality of YouTube videos for patient education on how to use asthma inhalers. World Allergy Organ J 2015;8(Suppl 1) A221. [CrossRef]