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ARE ONLINE STREAMING VIDEOS ON TRACHEOSTOMY CARE APPROPRIATE FOR MEDICAL EDUCATION?

TRAKEOSTOMİ BAKIMIYLA İLGİLİ ÇEVRİMİÇİ VİDEO AKIŞ SİTELERİNDE YAYINLANAN VİDEOLAR TIP EĞİTİMİNDE KULLANILMAK İÇİN UYGUN MUDUR?

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ABSTRACT

Objective: We aimed to analyze the quality of videos about tracheostomy care on an online video streaming site for teaching healthcare staff and medical students.

Material and Methods: In this cross-sectional, quantitative and exploratory study, firstly an online YouTube search was performed using the keywords "tracheostomy care" and "pediatric tracheostomy care". The total view counts, video duration and video source were recorded. The educational quality and accuracy of the video content were evaluated using the DISCERN, Global Quality Score (GQS), and Journal of the American Medical Association (JAMA) scores. Secondly, a pre-test comprising questions about tracheostomy care was administered to medical faculty students and intensive care nurses. Participants watched the three videos with the highest DISCERN, JAMA, and GQS scores before taking a post-test. The pre- and post-test scores were then compared.

Results: From the initial 339 videos, duplicated, non-English, and low sound quality videos were excluded, and 122 videos were analyzed. The mean DISCERN score was 39.4±8.7 (fair), the mean JAMA score 2.1±0.8 (fair), and the mean GQS 3.3±1.1 (fair). Sixty-one (50%) videos were related to medical education and 57 (46.7%) to patient education. Most of the videos were uploaded by non-physician healthcare staff. The pre- and post-test results showed that the videos uploaded by medical education websites and academic institutions had higher educational quality and may be utilized for online education.

Conclusions: Tracheostomy care videos on YouTube with the highest DISCERN, JAMA and GQS scores could be used for online learning by medical students and nurses in resource-limiting centers.

Keywords: Tracheostomy care, online and digital learning, YouTube video quality.

ÖZ

Amaç : Sağlık personeli ve tıp öğrencilerine yönelik eğitim veren çevrimiçi bir video akışı sitesindeki trakeostomi bakımıyla ilgili videoların kalitesini analiz etmeyi amaçladık.

Gereç ve Yöntem: YouTube araması "trakeostomi bakımı" ve "pediatrik trakeostomi bakımı" anahtar kelimeleri kullanılarak yapıldı. Toplam görüntüleme sayısı, video süresi ve video kaynağı kaydedildi. Video içeriğinin eğitim kalitesi ve doğruluğu DISCERN, Global Quality Score (GQS) ve Journal of the American Medical Association (JAMA) puanları kullanılarak değerlendirildi.

İkinci olarak tıp fakültesi öğrencilerine ve yoğun bakım hemşirelerine trakeostomi bakımına ilişkin soruları içeren bir ön test uygulandı. Katılımcılar son teste girmeden önce DISCERN, JAMA ve GQS puanları en yüksek olan üç videoyu izlediler. Daha sonra ön ve son test puanları karşılaştırıldı. Katılımcılar son teste girmeden önce DISCERN, JAMA ve GQS puanları en yüksek olan üç videoyu izlediler. Daha sonra ön ve son test puanları karşılaştırıldı.

Bulgular: İlk 339 videodan kopya, İngilizce olmayan ve düşük ses kalitesine sahip videolar hariç tutuldu ve 122 video analiz edildi. Ortalama DISCERN puanı 39,4±8,7 (orta), ortalama JAMA puanı 2,1±0,8 (orta), GQS ortalaması 3,3±1,1 (orta) idi. Videoların 61'i (%50) tıp eğitimi, 57 m'si (%46,7) hasta eğitimi ile ilgiliydi.

Videoların çoğu doktor dışı sağlık personeli tarafından yüklendi. Ön ve son test sonuçları, tıp eğitimi veren siteler ve akademik kurumlar tarafından yüklenen videoların eğitim kalitesinin daha yüksek olduğunu ve çevrimiçi eğitim için kullanılabileceğini gösterdi.

Sonuçlar: YouTube'daki en yüksek DISCERN, JAMA ve GQS puanlarına sahip trakeostomi bakım videoları, kaynak kısıtlı merkezlerdeki tıp öğrencileri ve hemşireler tarafından çevrimiçi öğrenim için kullanılabilir.

Anahtar Kelimeler: Trakeostomi bakımı, çevrimiçi ve dijital öğrenme, YouTube video kalitesi.

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INTRODUCTION

According to US data, more than 50.000 patients receive tracheostomies annually (1). As the number of tracheostomies continues to rise, appropriate care for patients with tracheostomies is gaining further importance. Proper care prolongs life expectancy, increases quality of life, reduces morbidity, restores physiological functions, ensures normal growth and development and reduces the frequency/duration of hospitalizations, thus reducing health costs. However, if health personnel lack the necessary training and experience, patients with tracheostomies may receive suboptimal treatment and encounter serious complications, even death (2). Multidisciplinary teams are assembled to improve the care of patients with tracheostomy in some institutions (3). Educating the responsible staff on tracheostomy care is critical, and various methods can be applied to provide such education and achieve the best patient outcomes. Specialized teams and standardized training protocols using various simulations as well as written and visual materials for healthcare professionals and families can shorten the length of hospital stays and reduce costs (3). However, it is not feasible for every institution to access such simulation education or assemble multidisciplinary teams. Accordingly, online education with digital learning can play a major role, especially in centers with limited resources, and YouTube may be a video-based education tool for such centers (4).

YouTube is one of the most utilized social media platforms in the world and has developed into an exceptionally quick-growing visual library that surpasses 2.6 billion visitors per month and with five billion videos watched per day (5). Given its boundless data, YouTube offers a resource from which people can seek answers, gain information and obtain education (6). Since the videos on YouTube are quick, easy to access and free, they can also be used by medical students and healthcare workers (7,8). However, due to insufficient fact-checking and monitoring of the videos, YouTube may contain false and misleading health-related content. As a result, publishers and viewers of health-related videos need to be careful about the reliability and validity of the presented medical information (9). Even though different studies from a range of medical fields have assessed YouTube videos to our knowledge, no prior studies have analysed YouTube videos on tracheostomy care and their educational value (9,10). We therefore aimed to evaluate the quality and value of YouTube videos on tracheostomy care and to determine whether these videos could be used to educate medical students and intensive care (ICU) nurses.

MATERIALS and METHODS

Aim and study design

This study was a cross-sectional, quantitative, and exploratory study. The first part of the study included data collection and the evaluation of videos using DISCERN, Journal of the American Medical Association (JAMA) scores, and the Global Quality Score (GQS) to assess the academic and educational competences, and reliability of the video content. In the second part, we used pre- and post-tests to determine whether the videos with the highest scores had educational value. This study received approval from an institutional ethical committee (Date: 11.08.2022, No: 2022.278.IRB3.117).

Data collection

We conducted an online video search of YouTube on 18 April 2022 using the terms 'tracheostomy care' and 'pediatric tracheostomy care'. One experienced otolaryngologist (OG) and one pediatric intensivist (OO) assessed the videos. The default search settings were 'order videos by view count'. To prevent biased recommendations, all the video searches were conducted after completely clearing the browser search history and erasing all account log-ins.

Videos in any language other than English, soundless videos, duplicate videos and videos unrelated to tracheostomy care were excluded. Each video's total views count, title, duration (in seconds), time since upload (days), views per day, number of comments, number of likes and dislikes and like ratios (like×100/(like+dislike) were noted. The video's source was categorized into the following: physician (created by an individual physician, not an institution), healthcare staff (nurse, physiotherapist, etc.), hospital, organization, university, medical education website (professional healthcare video-sharing and digital learning websites), patient/patient-caregiver and other (advertising for trading company, private hospital). The videos were also grouped according to whether they provided medical education, patient education, or a patient's experience of tracheostomy.

DISCERN, JAMA, and GQS scores

DISCERN, GQS and JAMA are scoring systems used to assess the academic, educational competence and reliability of educational content. Oxford University developed the DISCERN grading system, which assesses the accuracy and instructional value of information, particularly concerning medical care. It comprises three sections, 16 questions, with each question having scores ranging from 1 to 5. The first segment (questions 1-8) assesses the validity of a publication. The following segment (questions 9-15) centers around information on treatment-related topics, and the last section analyses the overall calibre of the educational content. The evaluation is based on 15 questions, and the final question in the third segment is not scored. According to the 15-75 point rating scale, an item is either excellent (63-75 points), good (51-62 points), fair (39-50 points), poor (27-38 points), or very poor (15-26 points) (Supplementary Data 1) (11).

A video source's publishing and privacy details can be evaluated using the well-known JAMA rating system. Authorship, attribution, disclosure and currency are the four criteria, with each graded from 0 to 1. Four points denote the highest level of quality (12). Even though the DISCERN and JAMA scores were originally created for written information, these scores have been widely applied in various studies (13-15). The GQS scale can be utilized by users to assess video content via a five-point scoring system, with each response scoring 1-5 for a maximum achievable score of 5 points (see Supplementary Data 2 for the GQS and JAMA instruments) (16).

Video evaluation

The mean GQS, JAMA, and DISCERN scores of the investigators were recorded. To determine the inter-rater reliability, Kappa consistency analysis was used. The Kappa coefficient lies between 0 and 1, with values between 0.93 and 1.00 indicating perfect consistency, 0.81-0.92 very good consistency, 0.61-0.80 good consistency, 0.41-0.60 moderate consistency, 0.21-0.40 below moderate level consistency and 0.20-0.01 weak consistency. At the end of the evaluation, the three videos with the highest scores for all three scoring systems were selected as training videos to test their educational value.

Statistics

We used SPSS software version 23.0 (SPSS Inc., Chicago, IL) for all the statistical analyses. The descriptive statistics of the tracheostomy videos are shown as means and standard deviations. The frequency and percentages are presented for the categorical variables. To determine the normal distribution of the data, the Kolmogorov–Smirnov test was initially performed. The Kruskal–Wallis test was used to confirm the differences between the continuous variables among the groups. The significance of the pairwise differences with Bonferroni adjustment was examined using the Mann–Whitney *U* test. The correlation statistics were computed using Spearman's test. P values less than 0.05 were considered statistically significant.

Evaluation and statistical analysis of the pre-and post-tests

The second part of the study involved administering a pre-test to the medical faculty students (n=20), and ICU nurses (n=20). While the medical faculty students had no previous experience with tracheostomy care, the ICU nurses knew how to monitor and care for patients with tracheostomies. The pre-test was developed by an experienced pediatric intensivist (MT) who works as an instructor in an institutional simulation education center and within a multidisciplinary tracheostomy team. The pre-test comprised questions about tracheostomy care and an emergency condition in a patient with a tracheostomy. The test contained 10 multiple choice questions each scoring 10 points. The lowest total score in the test was 0 and the highest 100. Informed consent was obtained from all the participants before the pre-test. The participants watched the three YouTube videos (Supplementary Data 3) and then completed the post-test, which was the same as the pre-test (Supplementary Data 4). The pre- and post-tests were evaluated by the same researcher who scored each question equally. The total scores for each individual and the medical student and ICU nurse groups from the pre- and post-tests were compared.

The pre- and post-test results of the groups were compared using the Wilcoxon test. The pre- and post-test results of the groups were examined independently using the Mann–Whitney *U* test. Given a 5% first-type error (α), 0.95 standardized effect size, distribution ratio of 1:1 between the groups and 80% power (β is 0.20), the required minimum sample size was 38 participants in total with 19 participants for each group. G-Power was used for the power analysis. Twenty participants were included in each group to avoid the possibility of missing erroneous observations.

RESULTS

Descriptive characteristics

Of the 339 evaluated videos, 122 met the inclusion criteria (Table 1). Videos in any language other than English (n=10), soundless videos (n=16), duplicate videos (n=118), and videos unrelated to tracheostomy care (n=73) were excluded (Figure 1). Among the 122 videos, 41 (33.6%) were related to pediatric tracheostomy care and 81 (66.3%) to adult tracheostomy care. Thirty-nine (31.9%) videos were uploaded by non-physician healthcare-staff, 28 (22.9%) by hospitals, 26 (21.3%) by organizations, eight (6.5%) by universities, eight (6.5%) by medical education websites, four (3.2%) by physicians, and four (3.2%) by patient caregivers. In terms of content, 61 (50%) videos presented medical education content, 57 (46.7%) patient education content and four (3.2%) patient caregiver experience of patients with tracheostomies. The majority of the videos were posted in the United States (75%) and the UK (13.9%), with 4.9% in China and 2.4% in India.

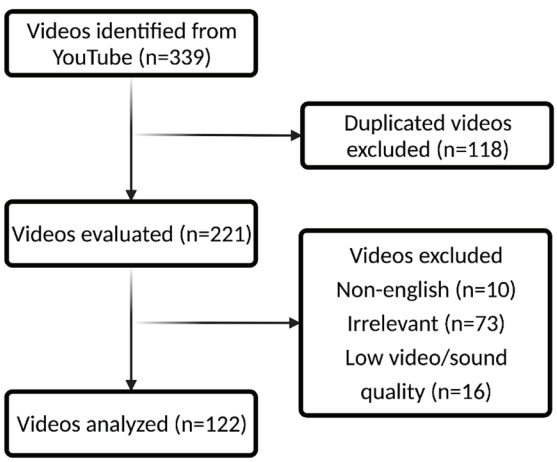

Figure 1: Flow chart of tracheostomy videos that were evaluated

Table 1: Descriptive statistics of tracheostomy videos

Descriptive statistics	Mean±SD	Range
View count, (n)	88185.8±185970.4	39-1403098
Duration of video (second)	404±336.8	42-1420
Time since upload date (day)	1921.2±1103.3	243-4916
View ratio (Daily views)	46.2±79.6	0.1-637.7
Likes, (n)	430.8±793.4	0-5000
Dislikes, (n)	28.3±76.9	0-677
Comments, (n)	13.2±26.2	0-182
Like ratio	93.9±6.3	66.3-100
DISCERN score	39.4±8.7	21-59
GQS score	3.3±1.1	1-5
JAMA score	2.1±0.8	0-4

GQS: Global Quality Score, JAMA: Journal of American Medical Association, SD: Standard deviation

Table 2: The mean DISCERN score, GQS score, and JAMA score according to categories of tracheostomy videos

Categories	n	DISCERN	GQS	JAMA
Medical education	61	38.6±7.1	3.2±0.9	1.9±0.8
Patient education	57	40.3±10.1	3.6±1.3	2.3±0.7
Patient/care giver experience	4	38.5±13.1	3.0±0.8	1.0±0.1
Total	122	39.4±8.7	3.3±1.1	2.1±0.8
p value		0.61	0.097	0.001

GQS: Global Quality Score, JAMA: Journal of American Medical Association, SD: Standard deviation,

Table 3: The mean DISCERN score, GQS score, and JAMA score according to categories of publishers

Publishers	n	DISCERN	GQS	JAMA
Non-Physician Health Personal	39	39.0±6.5	3.3±0.7	1.7±0.7
Hospital	28	43.2±8.7	4.1±0.9	2.2±0.6
Organization	26	35.1±7.5	2.7±1.2	2.3±0.6
University	8	43.5±6.9	3.6±0.9	2.6 ±0.7
Medical education website	8	51.1±6.4	4.6±0.5	3.1±0.6
Physician	4	34.0±7.8	2.2 ±1.2	1.7±0.9
Patient caregiver	4	30.0±9.4	2.6±0.9	1.0±0.1
Others	5	33.2±12.4	2.4±0.9	1.8±1.1
Total	122	39.4±8.7	3.3±1.1	2.1±0.8

GQS: Global Quality Score, JAMA: Journal of American Medical Association, SD: Standard deviationv

Interrater reliability analysis

The interrater reliability of two investigators' Kappa consistency analysis revealed that the DISCERN, GQS and JAMA scores had very good consistency. The Kappa coefficients of the DISCERN, GQS, JAMA scores were 0.84, 0.82 and 0.91, respectively (p<0.001). The highest consistency was evident in the JAMA scores. Since there was consistency between the scores given by the two researchers, the scores were calculated using the average of the two investigators.

DISCERN evaluation

The mean DISCERN score for all the videos was 39.4±8.7 (fair). Based on the video categories, the mean DISCERN scores of the medical education, patient education and patient/caregiver experience videos were 38.6±7.1, 40.3±10.1 and 38.5±13.1 respectively. The differences were not statistically significant (p=0.61) (Table 2). For the video publisher categories, the DISCERN score of the medical education websites was highest at 51.1±6.4 (good), while university, hospital, and healthcare-staff's videos scored 43.5±6.9, 43.2±8.7, 39.0±6.5, respectively (Table 3).

JAMA evaluation

The mean JAMA score of all the videos was 2.1±0.8. For the video categories, the JAMA scores were 2.3±0.7, 1.9±0.8 and 1.0±0.1, for the patient education, medical education and patient/caregiver experience videos, respectively (Table 2). For the video publisher categories, the mean JAMA score for the medical education website was highest (3.1±0.6), followed the videos by universities (2.6±0.7), organizations (2.3±0.6) and hospitals (2.2±0.6; p<0.001) (Table 3).

GQS evaluation

The mean GQS of all the videos was 3.31.1, while in the individual categories, the patient education videos scored 3.6±1.3, the medical education videos 3.2±0.9 and the patient/caregiver experience videos 3.0±0.8 (Table 2). For the video publisher categories, the mean GQS score of medical education website was highest at 4.6±0.5, with the hospital and university videos scoring 4.1±0.9 and 3.6±0.9, respectively (Table 3).

Comparison of the DISCERN, JAMA, and GQS scores

The mean values of the DISCERN, GQS and JAMA scores were 39.4±8.7 (poor), 3.3±1.1 (fair), and 2.1±0.8 (fair), respectively. No statistically significant differences were found for the DISCERN, and GQS scores for the patient education, medical education and patient/caregiver experience video categories (p=0.60, p=0.097, p=0.67 respectively). In contrast, the mean JAMA scores were significantly different among the video categories (p<0.001), with the patient educational videos receiving the highest JAMA score (Table 2). The patient education and medical educational videos had significantly higher JAMA scores than those of the patient/caregiver experience videos (patient education videos vs. patient/caregiver experience vi-

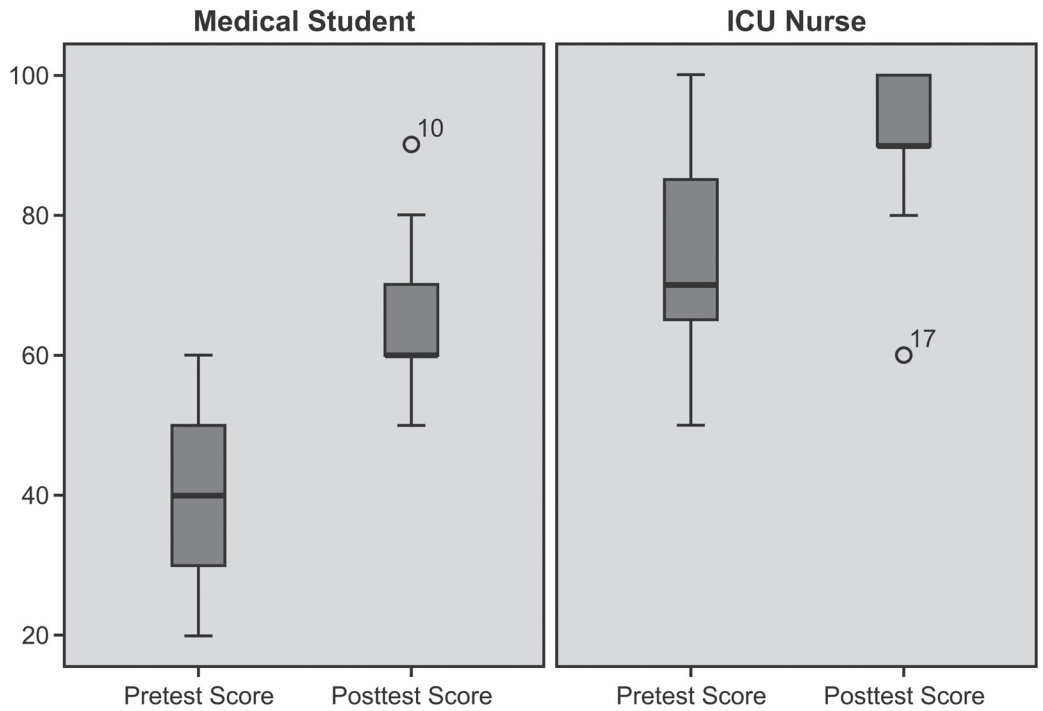

Figure 2: The pre-test and post-test scores of the medical student and ICU nurse are shown with Boxplot chart. On the left side of the figure medical student pre-test and post-test scores, and on the right side, the ICU nurse pre-test and post-test scores are shown. Accordingly, for medical students the pre-test minimum score was 20, the post-test minimum score was 50. For the ICU nurse, the pre-test minimum score was 50, the post-test minimum score was 60. In the box plot, the upper lines show the max value in the data set. While the maximum score was 60 for the pre-test for the medical group, this value is 90 for the post-test. For the nurse group, the maximum score is 100 for the pre-test, the maximum score is 100 for the post-test. The difference between these values (min-max) is the range value and shows the distribution. The length of the post-test score box is two times shorter than in the pre-test score box. This shows that the distribution of the post-test score is narrower than the pre-test. The bold lines in the boxes in the figure show the median values. For the medical student group, the median value of the pre-test is 40, while the median value of the post-test is 60. For the ICU nurse group, the median value of the pre-test was 70, while the median value of the post-test was 90. When the pre and post-test results were compared, it was seen that there was a significant increase in scores for each participant individually and for a group average (p<.001).

deos p<0.001, medical education videos vs. patient/caregiver experience videos p<0.01, patient education vs. medical education p<0.01) (Table 2). In terms of publishers, the medical education website videos had the highest DISCERN (51.1±6.4), GQS (4.6±0.5), and JAMA scores (3.1±0.6) (p< 0.01) (Table 3). The videos uploaded by the medical education websites, hospitals and universities had higher DISCERN, GQS, and JAMA scores than physicians' videos (individually uploaded by a physician, not an institution), the non-physician healthcare staff videos, the patient videos and other advertising-sourced videos (p<0.01, p< 0.01, p< 0.001, respectively).

Selection of the videos that used for tracheostomy care education

Since the JAMA score had highest reliability and consistency among the 122 videos, the seven videos with the highest JAMA scores were chosen (4). Of these, the three videos with the highest DISCERN and GBS scores were selected (the DISCERN and GBS scores of the first, second and third videos were 55, 54, 55 and 5, 5, 5 respectively). After the first pre-test, the participants watched these three videos, and the post-test was then administered.

Figure 2 shows the participants' pre- and post-test scores. The minimum pre-test scores for the medical students and ICU nurses were 20 and 40, and the minimum post-test scores 50 and 70, respectively. Although the maximum pre-test score was 60 for the for the medical student group, this value was 90 in the post-test. The maximum pre- and post-test scores were 90 and 100, respectively for the ICU nurse group. The median values of the pre-tests were 40 and 70 for the medical student and ICU nurse groups and 60 and 90 for the post-tests, respectively.

When the pre- and post-test results were compared, a significant increase was noted in the scores for each participant individually and the group average ($p<0.001$).

DISCUSSION

Technology and internet usage is increasing every day and YouTube has become one of the most important education modalities, especially in nursing, teaching technical skills and promoting self-confidence of patient care in medicine (17-21). Although healthcare professionals may prefer YouTube as a platform to access educational videos on tracheostomy care, our results demonstrated that most of these videos provided inadequate information. In our study regarding the video categories, medical education videos were the highest per category; however, the scores of the medical education videos were not on par. Nonetheless, the 'medical educational videos' had higher and statistically significant scores compared to the videos within the 'patient' and 'patient-caregiver experience' categories. Fisher et al analyzed educational value of arthrocentesis videos showed similar results that the majority of YouTube videos related with arthrocentesis were of moderate quality (22). However, Katz et al suggested in their review study that the COVID-19 pandemic brought online web-based learning to the foreground of medical education and institutions should use social media platform for rapid information dissemination in medical education (23). Tackett et al explained the advantages of the online videos over traditional education modalities in that they can reach learners all over the world free of charge; however, the content and quality of videos are the main issues to be discussed (24). In our study, interestingly, the average DISCERN, GQS, and JAMA scores of the eight videos under the 'medical education website' category had statistically higher scores than all the other groups (DISCERN score=51.1±6.4 [good], GQS=4.6±0.5 [good], and JAMA score=3.1±0.6 [good], $p<0.01$). All eight videos were uploaded via the medical education website OPEN pediatrics (www.openpediatrics.org), which is a free, open-access and peer-reviewed online network for healthcare professionals that is supported by hospitals and research institutions such as Boston Children's Hospital. These videos were better than the others in terms of the video quality, and reliability and currency of the information. Therefore, such global formations, universities, research centers, and associations can collaborate to produce high-quality educational videos to be used by healthcare professionals especially in resource-limiting centers. During our analysis, the absence of key expressions in titles, such as 'for healthcare professionals' or 'for patients' were noted for most of the videos. Therefore, content creators responsible for uploading videos with the intention of training healthcare personnel should be aware that patients may have access to the content. To enable a better understanding by viewers, it would be beneficial to clearly identify or create a specific submission option for videos aimed at patients vs. healthcare professionals. Kucuk et al. similarly stressed the significance of identifying videos' intended audience in the video title (19). Sterling et al. reviewed twenty-nine studies to examine the effect of social media platform in graduate medical education and they showed that most of the studies were moderate in quality and most of those studies could not measure the knowledge of the residents that obtained from watched videos (25). The most striking feature of this study, compared to other studies, is that the top three videos with the highest scores from all three scoring systems were evaluated by pre- and post-tests. When the pre- and post-test results were compared, a significant increase in scores was noted for each individual participant and the group average. The study participants included medical students who had not yet received any tuition on tracheostomy care. In contrast, the ICU nurses would have received in-service training on tracheostomy care in addition to providing care for tracheostomy patients. This could explain the nurses' higher pre-tests results. Nevertheless, despite having no previous training, the medical student group, with as well as the nurse group with adequate training, scored significantly higher in the post-test, demonstrating that appropriate videos could be used both to educate students and provide continuing professional development for healthcare staff.

The DISCERN, JAMA, and GQS scores positively correlated with one another which is a considerably important discovery of the present study. Kucuk et al. and Yildiz et al. yielded similar findings by their studies that DISCERN, JAMA, and GQS scoring largely produced equidistant results with respect to the educational quality and video accuracy of the videos (19, 20). On the contrary, according to Azer, neither the DISCERN nor JAMA scoring systems were appropriate for analyzing videos because they were created for written information long before the YouTube era, and the included items are not capable of assessing videos (26). However, these scores have been widely applied in numerous similar studies (13-15). Moreover, Chen et al., demonstrated a positive correlation between DISCERN and GQS scores, and the latter have been used to assess the quality of the videos (13). Nonetheless, while these scoring systems are not perfect for evaluating videos, they can be used as quality and value indicators for videos. The length of the videos also had a statistically significant and positively correlated relationship with the DISCERN, JAMA, and GQS scores. We observed that the DISCERN, JAMA, and GQS scoring systems had a positive correlation with the duration of the videos. As the duration of the videos increases, the extent of educationally valuable, quality information expanded in a parallel manner. Meanwhile, according to Gill et al, online streaming well-established popular videos typically have a duration far less than the allotted ten minutes, which may be considerably important for healthcare professionals due to their very limited time (27). During the video preparation, it is therefore essential that the videos present adequate information within an appropriate time to prevent a loss of concentration among viewers (28).

A limitation of our study is that the pre and post-tests were only administered to one group (n=20) of medical students and one group (n=20) of ICU members. Although the actual sample size surpassed the calculated number, an increase in the sample size and bigger groups could be constructive in future studies. Furthermore, even though the pre- and post-test were

prepared and evaluated by a single person, the higher post-test scores demonstrate that the students and nurses increased their knowledge easily within a short period of time. In addition, although the post-test results showed an increase in scores for both groups, and it can be deduced that those who scored higher provide better care, we could not establish a direct link between the groups knowledge. However, by watching the videos several times, nurses and medical students could improve their knowledge and provide better care.

The inclusion of only English language videos in our study caused language barriers and was a significant constraint. The lack of proper subtitles and the translation of high-quality educational videos disadvantages participants from non-English speaking countries. A possible solution is for each country's relevant association (s) to collaborate with global associations to create videos in the national languages. Lastly, it should be noted that the analyzed videos were retrieved on 18 April 2022, so videos uploaded after that time were not included in this analysis.

Notwithstanding the aforesaid limitations, to decrease the subjectivity of the video evaluation process, the videos in our study were watched and analyzed separately by two researchers (OG; an otolaryngologist, and OO; a pediatric intensivist) who work in the multidisciplinary tracheostomy care team at our center. The calculated average of the DISCERN, GQS, and JAMA scores given by the researchers were included in the analysis. To avoid bias, a different researcher (MT) prepared and scored the participants' pre- and post-tests rather than the researchers who evaluated the videos.

Finally, the results of our study show that free online training can be provided for healthcare professionals and medical school students using well-prepared, high-quality and reliable videos. Online training may thus be an excellent alternative to improve the time and cost of student and healthcare staff training at centers with limited resources, inadequate capacity and/or simulation tools and lack of time and staffing to allocate to education. Nonetheless, several other studies with a higher number of participants and more videos of higher quality are needed to confirm and expand our findings. Likewise, cooperation between academic institutions, associations, and centers is necessary to prepare higher quality and reliable videos in the future.

CONCLUSION

Most of the videos on YouTube that provide education on tracheostomy care are sub-standard. Consequently, physicians and healthcare workers need to be aware of such restrictions when using this online platform to ensure they are receiving accurate medical information. Notwithstanding, videos that have the highest education scores can be utilized for online and digital learning purposes and continuing medical education. If global entities can collaborate to produce high-quality educational videos, they will appeal to large audiences, and free online training on YouTube could be organized for healthcare professionals working in resource-limited centers.

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