RESEARCH ARTICLE

Assessing the educational quality of laparoscopic appendectomy videos on YouTube used in surgical training

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Abstract

Objective: To evaluate the educational quality of laparoscopic appendectomy videos on YouTube as a learning resource for surgeons and trainees.

Method: The retrospective, cross-sectional study was conducted at the Department of Paediatric Surgery, Ordu University, Ordu, Turkiye, between March and June 2024, and comprised laparoscopic appendectomy YouTube videos uploaded between January 2010 and June 2024, assessing video origin, upload date, duration, Journal of the American Medical Association score, educational quality rating score, objective component rating score, video power index, and total video quality score. Three laparoscopically experienced surgeons and three senior paediatric surgery residents independently evaluated the videos. Data was analysed using R 4.0.5.

Results: Of the 64 videos reviewed, 38(59%) originated from India. Of the 20(31.2%) videos with a video power index score >10, 15(75%) had moderate quality, 3(15%) poor and 2(10%) good. Educational quality rating score and objective component rating score showed no significant differences between the groups of senior paediatric surgery residents and laparoscopically experienced surgeons ($p>0.05$). However, expertise influenced total video quality score ($p<0.05$), with senior paediatric surgery residents and laparoscopically experienced surgeons rating 40(62%) and 27(42%) videos, respectively, as of moderate quality. Poor ratings were given to 20(31.3%) videos by senior paediatric surgery residents, and to 34(53.1%) videos by laparoscopically experienced surgeons. Good ratings were given to 4(6%) videos by senior paediatric surgery residents, and to 3(4%) videos by laparoscopically experienced surgeons.

Conclusion: Most laparoscopic appendectomy videos on YouTube were found to be of moderate to poor quality, highlighting the need for curated content and expert guidance to enhance learning outcomes.

Key Words: Laparoscopy, Appendectomy, Education, YouTube, Appendicitis, Surgical education.

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Introduction

Acute appendicitis is one of the most common causes of emergency abdominal surgery in both adults and children, with an average incidence of 8% among paediatric patients.[1] Appendectomy remains the gold-standard treatment to prevent disease progression to perforation or peritonitis. While open appendectomy has been performed safely since the 19th century, laparoscopic appendectomy (LA), first described in 1983 [2], has become the preferred surgical technique in many centres due to its minimally invasive advantages.

In surgical education, appendectomy is one of the earliest procedures taught during general and paediatric surgery residency. Laparoscopic training requires adaptation from the three-dimensional (3D) perception of open surgery to a two-dimensional (2D) endoscopic view. This learning process relies heavily on repeated observation of surgical procedures. After achieving spatial orientation, trainees must master the sequential steps of LA, including patient positioning, port placement, dissection and specimen retrieval.[3,4]

In recent years, online video platforms have become increasingly integrated into surgical education. Founded in 2005, YouTube is the world's most widely used free video-sharing platform, providing unrestricted access to a vast number of surgical videos.[5] These videos are often used as supplementary learning resources by residents seeking to improve their understanding of surgical anatomy and procedural steps. However, the educational quality and reliability of such content remain questionable due to the absence of peer review or professional regulation.

The current study was planned to evaluate the

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educational quality of LA videos available on YouTube as a learning resource for surgeons and trainees.

Materials and Methods

The retrospective, cross-sectional study was conducted at the Department of Paediatric Surgery, Ordu University, Ordu, Turkiye, between March and June 2024. After approval from the institutional ethics review board, YouTube online platform was searched using key words 'Laparoscopic appendectomy', 'Laparoscopic treatment of appendicitis' and 'Laparoscopic surgery, appendicitis'.[5] Those included were LA videos in English language that were uploaded for global audience. Advertisement-oriented content, slideshow format, silent or music-only videos, those with incomprehensible audio or language, and animation-based videos were excluded.

Data was noted regarding video origin, upload date, duration, Journal of the American Medical Association (JAMA) score, educational quality rating score (EQRS), objective component rating score (OCRS), video power index (VPI) and total video quality score (TVQS). The URLs of all included videos were recorded at the time of data collection, and all metrics (views, likes, duration) reflect the values available at the time of analysis. All videos included in the study were independently reviewed and scored by six physicians. The LES group consisted of three senior surgeons with more than 10 years of experience in laparoscopic surgery, each performing approximately 60 laparoscopic appendectomies annually. The SPSR group consisted of three junior surgeons who were actively involved in surgical training and had 2–4 years of experience in laparoscopic procedures.

The inclusion of the SPSR group was intended to reflect the perspective of surgeons who actively use online video platforms, including YouTube, for surgical education. The educational and technical quality of the videos was evaluated using validated objective rating scales and the Total Video Quality Score (TVQS). The scores were analyzed and compared separately between the two groups to assess differences based on surgical experience.

For each video, data reliability, ethical considerations, conflicts of interest, ownership, and currency were evaluated as per the JAMA criteria[6], which is a rating scale with a total of 4 points, with 1 point for each criterion: authorship, meaning the presence of author identification, affiliations of authors, and indications of affiliated institutions; attribution. meaning the provision of detailed information on references and sources related to the content; currency, meaning the inclusion of updates that occur after the content is published; and disclosure, meaning the mention of conflict of interest and the financial sources or sponsors related to the video.

The EQRS was used to measure the quality and quantity of the information presented in the video. To assess the quality of education, a rating scale was prepared for each surgery by referring to the current guidelines.[1,7] The EQRS scoring system focuses on providing detailed information about all steps from the preparation stage of the operation (such as positioning the patient and positioning the team and trocars) to the completion of the operation (withdrawal of trocars and closure of the abdomen). It evaluates the demonstration and explanation of the eight essential surgical steps in laparoscopic appendectomy. For each step, the provision and demonstration of the required information were assessed, with 0 = not descriptive, 1 = explanatory, and 2 = detailed description (Table 1).

The surgical quality, based on the proficiency and skill of the surgeon conducting the laparoscopic fundoplication, was evaluated using the established OCRS[7], which evaluates the main headings of LA standard steps (abdominal entry, division of meso-appendix, specimen removal), focussing on the technical proficiency of the surgeon. All the steps were evaluated on a 0-5 scale (Table 2).

The VPI was calculated on the basis of like ratio (LR; Like*100/Like+Dislike) and view ratio (VR; Number of views/Days), with VPI = LR*VR/100).[8]

The EQRS and OCRS scores were added to generate TVQS to measure the surgical proficiency and educational content quality of the video[9], with <30th = poor, 30-60th = moderate, and >60th = good. The current study evaluated TVQS 0-17 as poor, 18-34 as moderate and 34-51 as good.

Data was analysed using R 4.0.5. Intergroup differences were assessed using independent-sample t-tests for comparing means of continuous variables, and chi-square tests for comparing categorical variables. Correlation analysis was conducted to examine the relationships between variables, utilising Pearson's correlation coefficient with the psych package (Revelle, 2023). $P<0.05$ was considered statistically significant.

Results

Of the 4,110 videos scanned, 64(1.55%) were analysed. Among them, the oldest uploaded video was dated March 30, 2008, and the most recent video was dated September 23, 2023. The shortest video duration was 01.42 min and the longest video was 20.15 min. Of the videos reviewed, 38(59.37%) originated from India,

Table-1: Educational quality rating score (EQRS) form which the participants filled out separately for each video.

STEPS	EQRS (0-16) SCORE (*0- Not descriptive, 1- Explanatory, 2-Detailed description)*

1. Position of the patient (0-2)
   - The patient was placed on the surgical table in the supine position.
   - The extremities were positioned as follows: the right arm was extended laterally (abducted at 90°), allowing for easy vascular/vital access by the anaesthesiologist, and the left arm was secured to the body.
   - During surgery, positional changes may be required (Trendelenburg, anti-Trendelenburg, left or right lateral tilt), and the patient should be securely fastened to the table.
   - Emptying the bladder before placing/inserting the Foley catheter reduces the risk of bladder damage
2. Positioning of the team (0-2)
   - The tower should be positioned on the patient's lower-right side.
   - The team should be arranged on the patient's left side.
   - The surgeon should be on the left side of the patient, the assistant surgeon should be on the right side, and the camera should be on the left side.
   - The nurse and table should be on the left side of the surgeon, at the foot end of the patient.
3. Positioning of the trocars (0-2)
   - A triangular working space is created.
   - A 10-12 mm trocar was placed into the abdomen through the umbilicus using either an open technique (Hasson technique) or a closed Veress needle.
   - The second trocar was 5 mm in size at the left lower lateral (medial to the iliac tubercle).
   - The third trocar, 5 mm in size, was placed through the suprapubic area, taking care to avoid the bladder.
   - The intra-abdominal carbon dioxide (CO2) pressure is set to 12-14 mmHg pressure and adjusted at a flow rate of 4-5 ml/min in the insufflator
4. Exploration of the abdominal cavity (0-2)
   - Traditionally, in all surgical operations, whether laparoscopic or open, careful exploration of the abdominal cavity at the outset is necessary to confirm the diagnosis and/or identify other issues.
   - The appendix, caecum, and terminal ileum were explored with two atraumatic graspers. In some cases, the appendix may assume an unusual position (retrocaecal, descends into the Douglas pouch, adheres to the abdominal wall, or is within an abscess).
   - When the appendix is found, possible fibrous adhesions should be dissected.
5. Division of the meso-appendix (0-2)
   - The most commonly used dissection and excision tools in laparoscopic surgery are ligating and cutting laparoscopic instruments (LIGASURE; HARMONIC). Dissection can be performed using a hook cautery
6. Tying up the appendicular base (0-2)
   - Before excision to prevent rectal complications, the rectum should be ligated using a laparoscopic loop knot or stapler.
7. Removal of the appendix (0-2)
   - If present, aspiration of intra-abdominal fluid is recommended because it reduces the bacterial load.
   - The use of a sterile laparoscopic bag (Endo bag) during appendix removal is an appropriate method to protect the abdominal wall from contamination. The use of a sterile laparoscopic bag (Endo bag) during the removal of the appendix is an appropriate method to protect the abdominal wall from contamination.
   - If the diameter of the appendix in paediatric patients is within 1 cm and is not perforated, it is appropriate to remove it through an 11 mm trocar.
   - Routine use of drains is not recommended; however, it may be used for prophylactic purposes in cases of abscess or widespread peritonitis, or in specific high-risk situations (such as patients receiving steroid therapy or having chronic diseases).
8. Removing trocars, closing the abdomen (0-2)
   - The trocars should be withdrawn after all intra-abdominal CO2 gas is completely evacuated.
   - A fascial suture should be placed instead of a 10-12mm trocar in the umbilical region to prevent umbilical hernia
   - Only skin sutures are sufficient instead of 5 mm trocars.

11(17.18%) from the United States, 4(6.25%) from Egypt, 3(4.68%) from England, 3(4.68%) from Pakistan, 2(3.12%) from Brazil, and 1(1.57%) each from France, Lebanon and Canada. The video with the highest number of views was from India, with 1.9 million views, followed by one from the US having 1.4 million views. The source of the videos was the same surgeon in 54(84.3%) cases.

Of the 20(31.2%) videos with VPI score >10, 15(75%) had moderate quality, 3(15%) poor and 2(10%) good. Of the 10(15.62%) videos with JAMA score >2, 8(80%) were in the moderate percentile, (10%) was in the good percentile, and 1(10%) was in the poor percentile (Table 3).

EQRS and OCRS showed no significant differences between the LES and SPSR groups ($p>0.05$) (Table 4-5). However, expertise influenced TVQS ($p<0.05$), with SPSR and LES groups rating 40(62%) and 27(42%) videos, respectively, as of moderate quality. Poor ratings were given to 20(31.3%) videos by SPSR group, and to 34(53.1%) videos by LES group. Good ratings were given to (4(6%) videos by SPSR group, and to 3(4%) videos by LES group (Table 6, Figure).

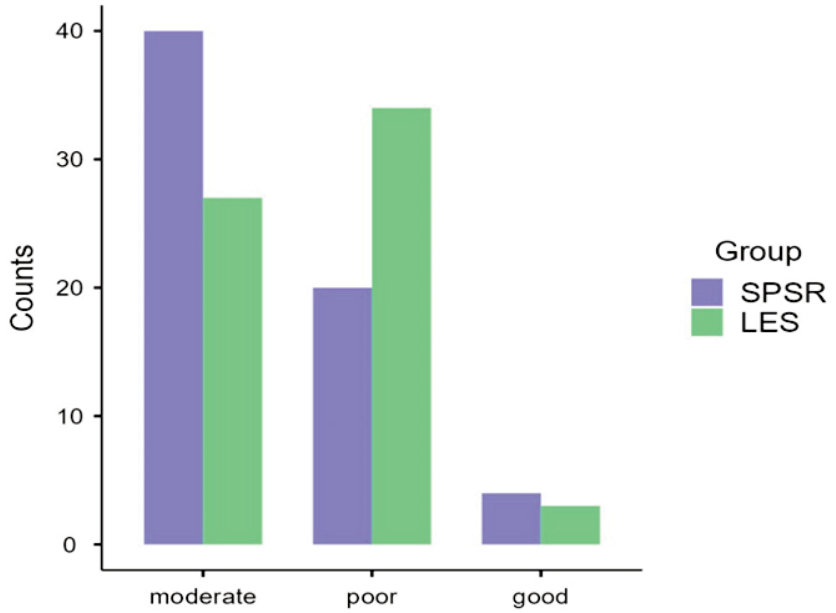

Figure: Scoring patterns between senior paediatric surgery residents (SPSRs) and laparoscopically experienced surgeons (LESs).

Table-2: Objective component rating score (OCRS) form which the participants filled out separately for each video.

OCRS (5-35)	
STEPS	**Score: [1-5] (Weak, Adequate, Perfect technical skills)**
I) Abdominal Entry	
Position of the patient and team	
Positioning of the trocars	
Exploration of the abdominal cavity	
II) Division of the meso-appendix	
Coagulation and section of the meso-appendix	
Tying up the appendicular base	
III) Specimen removal	
Removal of the appendix	
Removing trocars, closing the abdomen	
TOTAL SCORE:	

Table-3: Distribution of total video quality score (TVQS) among videos having higher video power index (VPI) and Journal of the American Medical Association (JAMA) score categories (only high-score ranges are presented.).

VPI (Like ratio* View ratio/100)	N	%	TVQS (n)
0-10	44	68	
10-100	16	25	Good (2), Moderate (12), Poor (2)
100 <	4	6,2	Moderate (3), Poor (1)
JAMA	N	%	
0-1	54	84,3	
2	9	14	Good (1), Moderate (7), Poor (1)
3-4	1	1,5	Moderate (1)

Table-4: Descriptive Statistics of objective component rating score (OCRS), educational quality rating score (EQRS) and total video quality score (TVQS) of 64 videos evaluated by six professionals.

Statistics	OCRS	EQRS	TVQS
N	6	6	6
Mean	14.52	5.73	20.22
Median	14.52	5.75	20.39
SD	3.79	1.40	5.13
Min	9.91	3.98	13.86
Max	20.67	7.72	28.27
Skewness	0.62	0.19	0.46
SE Skewness	0.85	0.85	0.85
Kurtosis	0.45	-1.22	-0.07
SE Kurtosis	1.74	1.74	1.74
Shapiro-Wilk W	0.96	0.96	0.97
Shapiro-Wilk p	0.85	0.86	0.86

SD: Standard deviation, SE: Standard error.

There was a moderate positive correlation between TVQS and OCRS ($r=0.46$, $p<0.01$) and between TVQS and EQRS ($r=0.41$, $p<0.05$). Conversely, VPI and JAMA scores showed no significant correlation with TVQS ($r=0.12$ and $r=0.09$, respectively, $p>0.05$).

Among all the videos evaluated, the 4(6.25%) with the highest mean TVQS were:

(1) "Laparoscopic appendectomy with concomitant laparoscopic cholecystectomy" (India, 12:01 min, 487 views, 27 likes);

(2) "Tough Laparoscopic Appendicectomy" (India, 9:22

Table-5: Comparison of objective component rating score (OCRS), educational quality rating score (EQRS) and total video quality score (TVQS) between senior paediatric surgery residents (SPSRs) and laparoscopically experienced surgeons (LESs).ge groups (years), Gender, BMI and Duration of disease (in weeks).

Variable	Group	Mean	SD	t	df	p	Mean difference	SE difference
OCRS	SPS	15.36	5.38	0.50	4	0.64	1.68	1.22
	ELS	13.68	2.18					
EQRS	SPS	6.10	1.92	0.61	4	0.58	0.74	3.35

SD: Standard deviation, SE: Standard error.

Table-6: Comparison of total video quality score (TVQS) distribution between senior paediatric surgery residents (SPSRs) and laparoscopically experienced surgeons (Less).

TVQS	SPSR	LES	Total	χ^2	df	p
Moderate	40 (62.5 %)	27 (%42.2)	67 (%52.3)			
Poor	20 (31.3%)	34 (%53.1)	54 (42.2%)	6.295	2	<0.05
Good	4 (6.3%)	3 (%4.7)	7 (5.5%)			
Total	64	64	128			

min, 16,000 views, 292 likes);

(3) "Laparoscopic appendectomy and partial caecum resection for carcinoid tumour" (Brazil, 3:50 min, 11,633 views, 18 likes); and

(4) "Laparoscopic appendectomy for perforated appendicitis with appendicular lump in a child" (India, 4:13 min, 574 views).

All the 4(6.25%) videos originated from surgeons and demonstrated optimal visualisation and procedural completeness.

Discussion

In recent years, surgeons and surgical trainees have increasingly preferred YouTube as a tool for surgical education. Celentano et al. reported that 86.7% surgical residents regularly watch online surgical videos, with YouTube and websurg.com being the most commonly used platforms.[10,11] The current study aimed at evaluating through validated scoring systems the educational quality of LA videos available on YouTube.

The VPI is calculated based on LR, and its inclusion aimed at determining whether popularity reflects educational quality. In the current study, 75% of the videos with VPI >10 had moderate educational quality. This suggests that high interaction does not necessarily indicate high educational value. Similarly, Erdem et al. and Frongia et al. reported no significant correlation between viewer interaction and educational quality.[8,9] Therefore, the VPI should not be considered a reliable parameter when selecting videos for learning purposes. Similarly, in the study by Ferhatoglu MF et al., which evaluated sleeve gastrectomy videos on YouTube using JAMA, VPI, DISCERN, and a procedure-specific scoring system, popularity metrics were also insufficient to determine educational reliability.[12]

Frongia et al. found that videos lasting >7 minutes were of better quality.[9] In the current study, however, no relationship was found between video duration (>10 minutes) and educational score, as 15 of the 20 longer videos were only of moderate quality. When the scores of the SPSR and LES groups were compared, no significant difference was found in EQRS and OCRS mean values. However, the SPSR group scored significantly higher on TVQS for videos rated in the moderate and good percentiles, while scoring lower in those rated as poor. This suggests that residents may perceive moderate-quality content more positively, reinforcing the need for expert supervision in video-based learning.

When all TVQS values were analysed, 53.1% of the 64 videos were moderate, 42% poor, and only 4.6% were good, indicating that most YouTube videos on LA have limited educational value. Therefore, video-based learning should be complemented by written resources and expert guidance to ensure proper surgical training.

De'Angelis et al.[13] evaluated the educational value of LA videos, and reported that 60% of videos with high critical view of safety scores scores were rated as good, but only 16% adequately demonstrated technical aspects. The current study, which used more detailed scoring systems (JAMA, EQRS, OCRS, TVQS) and a larger number of videos, revealed even lower overall quality (52% moderate, 42.2% poor). These findings highlight the inconsistency of open-access content, and the importance of expert-curated educational material.

The current study has several limitations. First, only English-language videos were included, which may not represent all available educational content. Second, although multiple validated scoring systems were used, the assessments still relied on subjective judgment. Additionally, viewer interaction data, such as likes and views, can change over time, potentially affecting VPI calculations. Despite the limitations, however, the study provides a broad and objective evaluation of YouTube's

current role in surgical education, and underlines the need for supervision and standardisation when using online platforms for learning.

On the basis of the current findings, it is recommended to develop standardised criteria for high-quality surgical content on public platforms, and to encourage trainees to use these resources in conjunction with structured, supervised training.

Further research should explore ways to improve the quality of online surgical videos, and evaluate their integration into formal surgical education programmes to maximise their educational value.

Conclusion

Most LA videos on YouTube were found to offer moderate to poor educational quality, emphasising the need for supplemental written resources and expert guidance to enhance learning outcomes for surgical trainees.

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AKA, VA, OY, CT, MAE & IB: Concept, design, data acquisition, analysis, interpretation, drafting, revision, final approval and agreement to be accountable for all aspects of the work.