

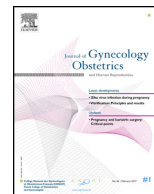


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## Original Article

# Relation between educational reliability and viewer interest in YouTube® videos depicting endometrioma cystectomy surgical techniques☆

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## ABSTRACT

**Objective:** To assess the reliability of YouTube® endometrioma cystectomy videos based on technical video analysis and considering the surgical steps.

**Material and method:** The present study yielded 756 videos after a search on YouTube® with the keywords “endometriosis cystectomy, endometrioma cystectomy, chocolate cyst cystectomy, and endometrioma surgery” during the period from January 7, 2007 to January 7, 2019. The viewer interest parameters such as total number of subscribers, views, likes, dislikes, comments, source of the videos, and the date of upload were assessed. Besides, the surgical steps were also evaluated considering committee suggestions.

**Results:** There were 140 (78.7 %) videos in Group 1 (not useful and slightly useful) and 38 (21.3 %) videos in Group 2 (useful and very useful). The mean numbers of subscribers, views, and likes were  $5737.843 \pm 15741.302$ ,  $10614.257 \pm 32702.339$ , and  $17.7 \pm 43.57$ , respectively, in Group 1, and  $851.052 \pm 1613.599$ ,  $8192.55 \pm 15989.955$ , and  $11.92 \pm 27.52$ , respectively, in Group 2. The type of surgery was significantly different between the study groups. The videos of cases with robotic surgeries presented more useful descriptive information ( $p = 0.003$ ). There was a significant difference between the study groups regarding the type of hemostasis. The presence of didactic steps was higher in Group 2 (47.4 %) compared to Group 1 (28.6 %) ( $p = 0.02$ ).

**Conclusions:** Overall, only around 21 % of YouTube videos presenting endometrioma surgery were defined as useful or very useful. The interest rates of the viewers may not compatible with the usefulness rate of the videos.

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## Introduction

Before the era of the Internet, surgical training was carried out through a master–apprentice relationship and reference to medical resources, such as textbooks and articles published in academic journals. However, the widespread use of the Internet over the past two decades has changed surgical training [1,2].

The Internet provides access to a wide range of online medical information and visual educational resources. One of the most

common Internet-based visual information and entertainment platforms, YouTube®, boasts more than 2 billion video views every day [3]. Increasing numbers of medical professionals recognize the importance of YouTube® as an online source of both medical knowledge and demonstration videos for various surgical techniques [4]. These instructional videos enhance surgical skills by transmitting visual and auditory stimuli to the learning center of the brain, in contrast to merely reading medical journals or textbooks [5]. Although researchers representing various specialties have analyzed the accuracy of YouTube® videos about a range of topics, such as prostate cancer, sleeve gastrectomy, thyroid cancer, and tonsillectomy, controversy regarding about the reliability of these videos due to the lack of peer review persists [5–8]. Many of the surgical videos focus mainly on technical pictures of the case instead of presenting a full description of the case, preoperative diagnostic procedures, issues of informed

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consent, type of planned surgery, surgical setup, or the didactic steps of the surgical procedure [9].

Endometrioma surgery, which could have detrimental effects on ovarian reserve, requires advanced surgical training to achieve familiarity with the pelvic anatomy and to obtain the necessary surgical skills to safely perform the procedures [10]. The European Society for Gynaecological Endoscopy (ESGE), European Society of Human Reproduction and Embryology (ESHRE), and World Endometriosis Society (WES) working groups have made recommendations for both initial stages of laparoscopy and endometrioma cystectomy.

This study was performed to assess the reliability of YouTube® endometrioma cystectomy videos based on technical video analysis and considering the surgical steps in light of the ESGE, ESHRE, and WES working group suggestions.

## Material and methods

A search on YouTube® (<https://www.youtube.com>) was performed with the keywords “endometriosis cystectomy, endometrioma cystectomy, chocolate cyst cystectomy, and endometrioma surgery”. To achieve the most reliable results, these search terms were selected based on previously searched terms related to laparoscopic endometrioma surgery [10]. All videos satisfying the defined keywords were evaluated. The search yielded 756 videos presented during the period from January 7, 2007 to January 7, 2019. No ethics committee approval was required, as this was an observational study performed using only publicly available data.

## Video analysis

Videos presenting gynecological laparoscopic surgeries other than ovarian endometrioma surgery, such as deep infiltrating endometriosis cases that primarily described the surgical treatment of bowel, bladder/ureter, diaphragm, and peritoneal endometriosis, were excluded. Videos related to hysterectomy, cystectomy for simple cysts or dermoid cysts, and surgical treatment of any gynecological malignancies were also excluded. Videos depicting individual experiences presented by healthcare professionals regarding endometriosis surgery, etiology of the disease, and imaging modalities were excluded. Videos describing patients' individual experiences about the course of the disease, duplicated videos, and videos for which the numbers of likes, dislikes, or comments had been disabled by the uploader were also excluded from the analysis. In addition, videos with descriptive content in languages other than English were excluded.

After application of the exclusion criteria outlined above, two surgeons (CK, TU), both experienced in laparoscopic endometrioma surgery, reviewed and classified all of the videos. The sources of the videos, i.e., surgeon/practitioner, hospital/free clinic, social media/TV, medical site, university, and advertisement, were recorded. The date of video upload, total number of subscribers, views, likes, dislikes, and comments, the time passed since video upload, duration of the video, views per day, ratios such as like/view, like/subscriber, view/subscriber, like ratio ( $\text{like} \times 100 / [\text{like} + \text{dislike}]$ ), view ratio (number of views/days), and Video Power Index (VPI;  $\text{like ratio} \times \text{view ratio} / 100$ ) were calculated [11]. The presence of sound or music was also noted. The reliability of the videos was evaluated by a previously defined “usefulness score of healthcare videos” [4], which rates the presentation of information about cause, symptoms, diagnosis, treatment, and recovery for a given health problem. The variables were scored as follows: 0, not mentioned; 1, mentioned briefly; and 2, described in detail. With regard to the videos' usefulness, a total score of 0 was defined as not useful, 1–3 as slightly useful, 4–7 as useful, and 8–10 as very useful. All of the videos were divided into two groups,

i.e., not useful and slightly useful (Group 1) and useful and very useful videos (Group 2). We also evaluated the videos according to their publication dates, taking into account the historical development of video quality technology. [12]

## Surgical analysis

To categorize the best surgical technique for laparoscopic ovarian endometrioma cystectomy, we used the recent recommendations for endometrioma surgery from the ESGE, ESHRE, and WES working groups [13]. These recommendations could be divided in two parts: initial stages of laparoscopy and total cystectomy procedure. The first part consists of four suggestions: i) inspection of the pelvic organs, upper abdomen, and appendix; ii) use of at least three laparoscopic working ports to facilitate surgery; and iii) separation of the ovary and endometrioma from the pelvic sidewall if there is adhesion. If there is no adhesion, the incision should be performed over the thinnest part of the endometriotic surface or on the antimesenteric part of the ovary, followed by inspection of the cyst cavity to exclude the presence of any malignancy.

The recommendations for the second part include i) making an incision to obtain the appropriate cleavage plane to avoid damage to the blood vessels in the hilum/meso-ovarium; ii) achieving a convenient dissection plane by injection of saline or diluted synthetic vasopressin solution (0.1–1 unit/mL) under the cyst capsule; a cyst wall biopsy may be required for histological diagnosis in cases where ablation is used due to absence of a cleavage plane; iii) gentle traction and counter traction performed with appropriate instruments to dissect the cyst capsule; iv) achieving meticulous hemostasis by spot bipolar coagulation, laser, plasma energy, suture, or intra-ovarian hemostatic sealant agents; and v) retrieval of small cyst walls through a port or a specimen retrieval bag.

We used three additional evaluation parameters, which were the highest rated variables suggested by a recent study evaluating the expectations of physicians regarding laparoscopic surgeries, i.e., the presence of didactic steps, informed consent, and presenting surgical setup [9]. The rate of observed residual endometriotic tissue at the end of the video, type of surgery, trocar placement, and laterality of the cyst were also recorded.

## Statistical analysis

Statistical analysis was performed using SPSS Version 20 (SPSS, Inc., Chicago, IL). The kappa coefficient was used to evaluate the agreement between two independent reviewers. The Kolmogorov–Smirnov test was used to determine the normality of the distributions of continuous variables. The Mann–Whitney *U* test was used for comparison of ordinal variables or continuous variables that did not fit a normal distribution. The independent *t*-test was used to compare continuous variables with normal distributions. Categorical variables were compared using Pearson's chi-square test or Fisher's exact test. Kruskal–Wallis test used for nonparametric comparisons of video release years. Spearman's correlation analysis was performed to determine the relations between the usefulness score of the videos and rates of viewer interest. In all analyses,  $p < 0.05$  was taken to indicate statistical significance.

## Results

After evaluation of the videos, a significant degree of inter-reviewer reliability (kappa score 0.914) was found between the reviewers regarding their usefulness scores. The video analysis process revealed 178 (23.54 %) endometrioma cystectomy videos,

**Table 1**

Basic characteristics of the endometrioma videos in regards to usefulness criteria.

		Group 1 median(min-max) (n/%)	Group 2 median(min-max) (n/%)	p value
Usefulness scores	Cause	0 (0–2)	2 (0–2)	<0.001
	Symptoms	0 (0–2)	2 (0–2)	<0.001
	Diagnose	1 (0–2)	1 (0–2)	<0.001
	Treatment	1 (0–2)	2 (0–2)	<0.001
	Recovery	0 (0–2)	0 (0–2)	<0.001
Residual endometriotic tissue at the end of the video	Observed	88 (62.8 %)	13 (34.2 %)	<0.001
	Not observed	24 (17.2 %)	18 (47.4 %)	
	N/A	28 (20 %)	7 (18.4 %)	
Type of surgery	Laparoscopic	137 (97.9 %)	32 (84.2 %)	0.003
	Robotic	3 (2.1 %)	6 (15.8 %)	
Presence of endometrioma	Unilateral	120 (85.7 %)	33 (86.8 %)	0.859
	Bilateral	20 (14.3 %)	5 (13.2 %)	
Trocarr placement	Suprapubic	52 (37.1 %)	17 (44.7 %)	0.891
	Ipsilateral	62 (44.3 %)	12 (31.6 %)	
	Contralateral	23 (16.4 %)	8 (21.1 %)	
Video release date	Single incision-umbilical	3 (2.1 %)	1 (2.6 %)	
	<2012	25 (17.9 %)	5 (13.2 %)	0.505
	2012–2017	70 (50 %)	23 (60.5 %)	
	>2017	45 (32.1 %)	10 (26.3 %)	

64 (8.5 %) videos of patients' individual experience about the disease, 107 (14.15 %) informative videos about endometriosis presented by healthcare professionals, 198 (26.19 %) videos of benign or malignant gynecological surgery other than endometriosis, 206 (27.24 %) videos of deep infiltrating endometriosis, and 3 (0.39 %) videos presented with descriptive information in a language other than English.

Group 1 (not useful and slightly useful) included 140 (79 %) videos and Group 2 (useful and very useful) comprised 38 (21 %) videos. There was no significant difference between the study groups regarding uni/bilaterality of the ovarian cysts or trocar placement. However, the type of surgery was significantly different between the study groups. The videos of cases with robotic surgeries presented more useful descriptive information ( $P = 0.003$ ). In addition, the rate of observed residual endometriotic tissue was higher in Group 1 (62.8 %) than Group 2 (34.2 %) videos ( $p = <0.001$ ). The numbers of cases with no residual endometriotic tissue or with additional endometriotic foci reducing surgeries were 24 (17.2 %) in Group 1 and 18 (47.4 %) in Group 2 (Table 1). There was no significant difference regarding the usefulness score between the subgroup analysis of video release years (Table 2).

The mean numbers of subscribers, views, and likes were  $5737.843 \pm 15741.302$ ,  $10614.257 \pm 32702.339$ , and  $17.7 \pm 43.57$ , respectively, in Group 1, and  $851.052 \pm 1613.599$ ,  $8192.55 \pm 15989.955$ , and  $11.92 \pm 27.52$ , respectively, in Group 2. The majority of videos were uploaded by surgeon/practitioners in both Group 1 (82.9 %) and Group 2 (81.6 %). None of the videos had been uploaded by university hospitals. Ratings of video technical characteristic were similar between the study groups (Table 3).

With regard to surgical technical parameters such as informed consent, presenting surgical setup, inspection of the pelvis/abdomen, number of working ports, ovarian adhesiolysis from the pelvic sidewall, inspection of the cyst cavity, initial ovarian cortex incision, dealing with finding a cleavage plane, performing gentle traction-counter traction, and retrieval method of the cyst

capsule, the results were similar for both study groups. However, there was a significant difference between the study groups regarding the type of hemostasis. Hemostasis was achieved by suturing in 23 (16.4 %) patients in Group 1 and 3 (7.9 %) in Group 2, by laser ablation in 4 (2.9 %) patients in Group 1 and 3 (7.9 %) in Group 2, and by plasma energy in 2 (1.4 %) patients in Group 1 and 4 (10.5 %) patients in Group 2 ( $P = 0.007$ ). The presence of didactic steps was higher in Group 2 (47.4 %) compared to Group 1 (28.6 %) ( $p = 0.02$ ) (Table 4).

There were no significant correlations between the usefulness scores, views/days, view/subscriber rate, like/subscriber and like/view rate, like ratio, and VPI rates (Table 5).

## Discussion

Educational videos for medical students, residents, and surgeons could improve their learning and understanding and shorten their learning curves as supplements to current written medical curricula [14,15]. Further skills could be acquired by observing clinicians, practicing on mannequins, and working on real patients [16]. On the other hand, presentation of inappropriate, inadequate, or misleading information by healthcare professionals may be harmful to nonspecialists [15].

YouTube® has achieved popularity among patients and healthcare professionals [17] as a source of virtual education due to its comprehensive archive of medical videos. Registered users have the opportunity to upload their videos on YouTube® without any scientific confirmation or data standardization [18]. However, previous studies have described the data provided by YouTube® videos in health-related topics as poor, inadequate, and unverified [19,20]. The reliability of the results was inconsistent depending on the area of interest and data source [15,21]. There is no peer-review process for YouTube® videos, so there is no traditional mechanism to confirm the standards of evidence-based medicine [8]. Regardless of the aim of uploading these videos, they should

**Table 2**

Comparison of usefulness score considering video release date.

	<2012 (n:30)	2012–2017 (n:93)	>2017 (n:55)	p value
Usefulness score (median/min-max)	2 /(2–10)	2 /(2–10)	2 /(2–10)	0.462

**Table 3**  
Video analysis of the endometrioma surgeries in regards to usefulness criteria.

		Group 1 n(%),mean ± SD	Group 2 n(%),mean ± SD	p value
Source	Surgeon/practitioner	116 (82.9 %)	31(81.6 %)	0.732
	Hospital/free clinic	15 (10.7 %)	3 (7.9 %)	
	Medical website	8 (5.7 %)	4 (10.5 %)	
	University	0	0	
	Advertisement	1 (0.7 %)	0	
Sound	Didactic Voice	20 (14.3 %)	6 (15.8 %)	0.655
	Music	19 (13.6 %)	6 (15.8 %)	
	None	101 (72.1 %)	26 (68.4 %)	
Number of subscriber		5737.843 ± 15741.302 (0–56000)	851.052 ± 1613.599 (0–9500)	0.883
Number of view		10614.257 ± 32702.339(1–232917)	8192.55 ± 15989.955(5–65000)	0.505
Number of like		17.7 ± 43.57(0–336)	11.92 ± 27.52(0–159)	0.353
Number of dislike		2.25 ± 6.51(0–55)	1.63 ± 3.99 (0–21)	0.426
Number of comment		1.71 ± 4.74(0–34)	1.55 ± 4.09(0–18)	0.76
Video length (sec.)		633.09 ± 684.68(30–5117)	685.55 ± 890.91 (77–5047)	0.983
Time passed since video upload (days)		1532.97 ± 1112.77 (7–4406)	1276.55 ± 895.07 (21–3338)	0.306
View/day		5.41 ± 15.23 (0–111)	5 ± 9.15 (0.1–40.9)	0.158
Like/subscriber		0.06 ± 0.17(0–1.1)	0.12 ± 0.3 (0–1.5)	0.09
Like/view		0.009 ± 0.03 (0–0.34)	0.008 ± 0.01 (0–0.06)	0.19
View/ subscriber		89.13 ± 576.83 (0–6500)	163.71 ± 600.96 (0–6500)	0.425
VPI		5.81 13.3 (0–95)	4.86 8.18 (0.09–34.1)	0.84
Like ratio		84.67 24.36(0–100)	92.90 11.89(50–100)	0.09

**VPI:** Video Power Index.

**Table 4**  
Analysis of surgical technic of the endometrioma cystectomies in regards to usefulness criteria.

		Group 1 (n/%)	Group 2 (n/%)	p value
Initial laparoscopic stages				
	Inspection of the pelvis/abdomen			0.123
	Yes	16 (11.4 %)	8 (21.1 %)	
	No	124 (88.6 %)	30 (78.9 %)	
Number of working ports	3 ports	77 (55 %)	25 (65.8 %)	0.448
	2 ports	60 (42.9 %)	11 (28.9 %)	
	Single port	3 (2.1 %)	2 (5.3 %)	
Adhesiolysis	Yes	60 (42.9 %)	18 (47.4 %)	0.619
	No	80 (57.1 %)	20 (52.6 %)	
Inspection of cyst cavity	Yes	6 (4.3 %)	1 (2.6 %)	0.538
	No	134 (95.7 %)	37 (97.4 %)	
Cystectomy procedure				
	Antimesenteric incision			0.787
	Yes	139 (99.3 %)	38 (100 %)	
	No	1 (0.7 %)	0	
Hemostasis	Bipolar coutary	97 (69.3 %)	28 (73.7 %)	<b>0.007</b>
	Suture	23 (16.4 %)	3 (7.9 %)	
	Laser	4 (2.9 %)	3 (7.9 %)	
	Plasma	2 (1.4 %)	4 (10.5 %)	
	No need	14 (10 %)	0	
Cleavage	Vasopressin	8 (5.7 %)	1 (2.6 %)	0.846
	Coagulation	1 (0.7 %)	2 (5.3 %)	
	No	131 (93.6 %)	35 (92.1)	
Traction	Yes	135 (96.4 %)	38(100 %)	0.296
	No	5 (3.6 %)	0	
Tissue removal	Trocar	123 (87.9 %)	33 (86.8 %)	0.284
	Specimen bag	13 (9.3 %)	5 (13.2 %)	
	None	4 (2.9 %)	0	
Didactic steps	Yes	40 (28.6 %)	18 (47.4 %)	<b>0.02</b>
	No	100 (71.4 %)	20 (52.6 %)	
Patient's consent	Yes	0	1 (2.6 %)	0.213
	No	140 (100 %)	37 (97.4 %)	
Surgical set-up	Yes	9 (6.4 %)	5 (13.2 %)	0.182
	No	131 (93.6 %)	33 (86.8 %)	

follow all educational and surgical principles because they are open content with easy access.

The general population reportedly tends to view misleading videos more often than reliable videos. Biggs et al. [22] reported that useful informative rhinosinusitis videos tended to be longer than misleading videos. However, Lee et al. reported that useful and misleading videos with regard to patient information on gallstone disease were of approximately the same length, but they also showed that the videos considered as very useful had

significantly fewer views and likes than the misleading videos did [4]. In contrast, Sahin et al. evaluated videos about retinopathy of prematurity, and the useful videos seemed to have more views and likes than misleading videos [18]. In our study, we found no significant difference between the study groups in terms of viewer interest rates for the videos. Moreover, correlation analysis revealed no significant differences between the study groups in usefulness scores or video interest rates. This may have been because the characteristics of the viewers were not clear; their



**Table 5**

Spearman correlation analysis between the usefulness score and video interest rates of viewers.

	View/day		Like/view		Like/subscriber		View/subscriber		Like ratio		VPI	
	r	p	r	p	r	p	r	p	r	p	r	p
Usefulness score	0.126	0.09	0.08	0.25	0.123	0.11	0.05	0.51	0.11	0.23	0.03	0.69

VPI: Video Power Index.

ratings could be dependent on the reviewers being followers of the surgeon rather than on the merits of the surgical technique.

To achieve a complete surgical outcome and to reduce the risk of endometrioma recurrence, endometrioma cystectomy is the recommended method for endometrioma surgery [23]. However, to prevent destruction of ovarian follicles considering ovarian reserve [24], training of surgeons and standardization of the technique are mandatory. In addition, there are previous reports from different specialties have yielded conflicting results regarding the educational quality of YouTube® videos, and evidence regarding the reliability of endometrioma cystectomy videos is still lacking despite the large video archive on this platform [5–8].

In the present study, with regard to the technical surgical parameters, the results were similar for both study groups in the initial laparoscopic steps and cystectomy procedure. However, the rates of laser and plasma energy utilization were significantly higher in useful and very useful videos. The presence of didactic steps, which is one of the most highly rated variables that physicians wish to see in a laparoscopic surgery video [9], was higher in useful videos. Furthermore, robotic surgery videos had more useful descriptive information than did laparoscopic surgery videos. This could be explained by the emphasis of robotic surgeons on promoting robotic surgery in the field of endometriosis. However, written commentary and formal case presentation essentials, such as a detailed description of the patient's history and basic characteristics such as body mass index, accompanying comorbidities, presenting symptoms, information from diagnostic tests, postoperative complications, and follow-up data were missing in the majority of the videos. Surgical setup and trocar positioning and the details of permission from the patient for presentation of the video were also missing.

Our study has several limitations. First, the estimated viewer interest may not have been reliable due to the lack of information about the audience. Second, we evaluated videos presented with edited content.

## Conclusions

In summary, only around 21 % of YouTube® videos presenting endometrioma surgery were defined as useful or very useful. Robotic surgeries and videos in which didactic steps were presented were more often found to be useful or very useful. Reliable videos with accurate didactic information need to be uploaded by medical professionals or medical institutions after an external peer-review process. To generalize our results further studies are needed.

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Dr Cihan Kaya, Dr Taner Usta, Dr Hayriye Sema Baghaki, Dr Engin Oral have no conflicts of interest or financial ties to disclose.

## Declaration of Competing Interest

None.

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## References

- [1] Schmidt RS, Shi LL, Sethna A. Use of streaming media (YouTube®) as an educational tool for surgeons—a survey of AAFPRS members. *JAMA Facial Plast Surg* 2016;18:230–1, doi:http://dx.doi.org/10.1001/jamafacial.2016.0007.
- [2] Gutmann J, Kühbeck F, Berberat PO, Fischer MR, Engelhardt S, Sarikas A. Use of learning media by undergraduate medical students in pharmacology: a prospective cohort study. *PLoS One* 2015;10:e0122624, doi:http://dx.doi.org/10.1371/journal.pone.0122624.
- [3] Snelson C. YouTube across the disciplines: a review of the literature. *MERLOT J Online Learn Teach* 2011;7: 159–9.
- [4] Lee JS, Seo HS, Hong TH. YouTube as a source of patient information on gallstone disease. *World J Gastroenterol* 2014;20(14):4066–70, doi:http://dx.doi.org/10.3748/wjg.v20.i14.4066.
- [5] Ferhatoglu MF, Kartal A, Ekici U, Gurkan A. Evaluation of the reliability, utility, and quality of the information in sleeve gastrectomy videos shared on open access video sharing platform YouTube. *Obes Surg* 2019;29:1477–84, doi:http://dx.doi.org/10.1007/s11695-019-03738-2.
- [6] Steinberg PL, Wason S, Stern JM, Deters L, Kowal B, Seigne J. YouTube as source of prostate cancer information. *Urology* 2010;75:619–22, doi:http://dx.doi.org/10.1016/j.urolgy.2008.07.059.
- [7] Strychowski JE, Nayan S, Farrokhhyar F, MacLean J. You-Tube: a good source of information on pediatric tonsillectomy? *Int J Pediatr Otorhinolaryngol* 2013;77:972–5, doi:http://dx.doi.org/10.1016/j.ijporl.2013.03.023.
- [8] Shires CB, Wilson CD, Sebelik M. Thyroid surgery YouTube videos: estimating quality by surgeon characteristics and view rate. *Gland Surg* 2019;8:207–11, doi:http://dx.doi.org/10.21037/gs.2018.10.01.
- [9] Chauvet P, Botchorishvili R, Curinier S, Gremeau A, Campagne-Loiseau S, Houle C, et al. What is a good teaching video? Results of an online international survey. *J Minim Invasive Gynecol* 2019;22(19):30286–9, doi:http://dx.doi.org/10.1016/j.jmig.2019.05.023 pii: S1553-S4650.
- [10] Somigliana E, Berlanda N, Benaglia L, Viganò P, Vercellini P, Fedele L. Surgical excision of endometriomas and ovarian reserve: a systematic review on serum antimüllerian hormone level modifications. *Fertil Steril* 2012;98:1531–8, doi:http://dx.doi.org/10.1016/j.fertnstert.2012.08.009.
- [11] Erdem MN, Karaca S. Evaluating the accuracy and quality of the information in kyphosis videos shared on YouTube®. *Spine (Phila Pa 1986)* 1976;2018 (43):1334–9, doi:http://dx.doi.org/10.1097/BRS.0000000000002691.
- [12] Karwowski D, Grajek T, Klimaszewski K, Stankiewicz O, Stankowski J, Wegner K. 20 years of progress in video compression – from MPEG-1 to MPEG-H HEVC. General View on the path of video coding development. General View on the path of video coding development. In: Choraś R, editor. *Image processing and communications challenges 8*. IP&C 2016. Advances in intelligent systems and computing, vol 525. Springer, Cham; 2016.
- [13] Saridogan E, Becker CM, Feki A, Grimbizis GF, Hummelshoj L, Keckstein J, et al. Recommendations for the surgical treatment of endometriosis—part 1: ovarian endometrioma. Working group of ESGE, ESHRE, and WES. *Hum Reprod Open* 2017;2017(4), doi:http://dx.doi.org/10.1093/hropen/hox016 hox016.
- [14] Romanov K, Nevgi A. Do medical students watch video clips in eLearning and do these facilitate learning? *Med Teach* 2007;29:484–8, doi:http://dx.doi.org/10.1080/01421590701542119.
- [15] Ocak U. Evaluation of the content, quality, reliability and accuracy of YouTube videos regarding endotracheal intubation techniques. *Niger J Clin Pract* 2018;21:1651–5, doi:http://dx.doi.org/10.4103/njcp.njcp\_207\_18.
- [16] Azer SA, Algrain HA, AlKhelaif RA, AlEshaiwi SM. Evaluation of the educational value of YouTube videos about physical examination of the cardiovascular and respiratory systems. *J Med Internet Res* 2013;15:e241, doi:http://dx.doi.org/10.2196/jmir.2728.
- [17] Desai T, Shariff A, Dhingra V, Minhas D, Eure M, Kats M. Is content really king? An objective analysis of the public's response to medical videos on YouTube. *PLoS One* 2013;8:e82469, doi:http://dx.doi.org/10.1371/journal.pone.0082469.
- [18] Şahin A, Şahin M, Türkücü FM. YouTube as a source of information in retinopathy of prematurity. *Ir J Med Sci* 2019;188(2):613–7, doi:http://dx.doi.org/10.1007/s11845-018-1902-2.
- [19] Brooks FM, Lawrence H, Jones A, McCarthy MJ. YouTube™ as a source of patient information for lumbar discectomy. *Ann R Coll Surg Engl* 2014;96:144–6, doi:http://dx.doi.org/10.1308/003588414X13814021676396.

- [20] Madathil KC, Rivera Rodriguez AJ, Greenstein JS, Gramopadhye AK. Healthcare information on YouTube: a systematic review. *Health Informatics J* 2015;21:173–94, doi:<http://dx.doi.org/10.1177/1460458213512220>.
- [21] Bezner SK, Hodgman EI, Diesen DL, Clayton JT, Minkes RK, Langer JC, et al. Pediatric surgery on YouTube™: Is the truth out there? *J Pediatr Surg* 2014;49:586–9, doi:<http://dx.doi.org/10.1016/j.jpedsurg.2013.08.004>.
- [22] Biggs TC, Bird JH, Harries PG, Salib RJ. YouTube as a source of information on rhinosinusitis: the good, the bad and the ugly. *J Laryngol Otol* 2013;127:749–54, doi:<http://dx.doi.org/10.1017/S0022215113001473>.
- [23] Byrne D, Curnow T, Smith P, Cutner A, Saridogan E, Clark TJ. BSGE Endometriosis Centers. Laparoscopic excision of deep rectovaginal endometriosis in BSGE endometriosis centers: a multicenter prospective cohort study. *BMJ Open* 2018;8(4):e018924, doi:<http://dx.doi.org/10.1136/bmjopen-2017-018924>.
- [24] Ata B, Uncu G. Impact of endometriomas and their removal on ovarian reserve. *Curr Opin Obstet Gynecol* 2015;27:235–41, doi:<http://dx.doi.org/10.1097/GCO.0000000000000165>.