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REVIEW ARTICLE

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YouTube as a resource for surgical education with a focus on plastic surgery – a systematic review

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ABSTRACT

Surgery trainees use videos as a means to learn about surgical procedures. YouTube is the biggest online video platform and used for educational content as well but the medical information provided does not undergo peer review or other forms of scientific screening and can thus be of poorer quality. We performed a systematic review that examined the quality of educational videos about surgery and plastic surgery in particular on YouTube. The focus was towards studies on the benefit of YouTube videos for surgical trainees. A literature review was performed to determine the educational quality of plastic surgery videos found on YouTube. Articles reviewing the educational quality of videos about surgical procedures, their accuracy, and their utility for surgical trainees were included. An additional review was performed evaluating the literature about the quality of educational plastic surgery videos. Eleven articles were selected reviewing the educational quality of videos about surgical procedures. Six studies were fully assessed and evaluated concerning the quality of educational plastic surgery videos. There currently seems to be a lack of comprehensive educational surgery and in particular plastic surgery-related information on YouTube. The popularity of YouTube among surgical trainees is high. The quality of available educational surgical video content varies widely. It is in the interest of plastic surgery teaching institutions to provide trainees with high-quality educational video material.

Abbreviations: EQIP: ensuring quality information for patients; LAP VEGas: Laparoscopic surgery video educational guidelines; PICO model: patient, intervention, comparison, outcome(s); PRISMA: preferred reporting items for systematic reviews and meta-analyses

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Introduction

Over the last decade, the layout of surgical training has significantly changed [1]. Especially legislation regulating residents' working hours with a shift towards a shorter work week and rising economic pressure influencing the need for maximum efficiency in operating rooms have decreased the surgical teaching exposure for residents [2]. To provide patients with the necessary medical expertise in the future new teaching strategies outside of the operating room will have to be explored and implemented into the training curriculum [3]. This remains true not only from an ethical standpoint but also from an economic perspective as there is a direct correlation between surgical skills and surgery-associated complications [4]. In the past, some plastic surgeons have already employed instructional videos as a means of conveying information to generations of residents. Robert D. Acland, who is considered one of the pioneers of microsurgery created a video on the preconditions of microsurgical skills. It now has vintage character but the information provided remains as valid today as it was several decades ago [5]. The use of instructional videos for clinical skills teaching has even proven to result in improved learning outcomes compared with the traditional face-to-face didactic teaching methods [6]. Surgery and plastic surgery in particular rely on visual learning. Extensively reading about a certain procedure will typically not substitute for observing it at least once an issue most the popular plastic surgery educational books are addressing by containing a significant amount of visualization of surgical techniques. YouTube is the most well-known online video sharing site with over 2 billion views per day [7] and an average user spending at least 15 min a day on the site [8]. A recent study by Rapp et al. showed that YouTube is also the most frequently used educational video source for residents preparing for a surgical procedure [9]. However, the lack of upload criteria means that the instructional quality of available videos will vary widely [10]. In the field of laparoscopic surgery, the LAP VEGas guidelines were created to guide the production of high-quality surgical videos [11]. Other surgical fields, among them plastic surgery do not have these kinds of guidelines yet. Overall, there are still concerns about the quality of the available surgical educational video resources on YouTube and unregulated open mainstream media remains a controversial tool among teaching staff. In an attempt to identify relevant articles about the use of YouTube for surgical education in general we performed a systematic review of the current literature. We aimed to assess the quality of plastic surgery videos on YouTube and whether YouTube provides educational benefits for plastic surgery trainees in particular.

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Methods

Search method

The PICO model was employed to focus on this study's question. 'P' was defined as 'Surgical education', 'I' as 'YouTube', 'C' as 'standard teaching directly at the operating table' and 'O' as 'quality of available YouTube videos'.

A systematic review was then conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. A computerized search was performed including several scientific search engines (PubMed, Cochrane Library, MedLine and Web of Science). Searches were conducted on 9th May 2020. The Language was restricted to English and German. There was no time restriction. Two independent reviewers selected studies for inclusion in the systematic review. In case of disagreement, the independent reviewers discussed the study and, where necessary, the decision was made by a third independent reviewer. The search query used the keywords 'YouTube' and 'surgery'. Articles were selected based on inclusion criteria. The inclusion criteria were original, full-text studies focused on the quality of YouTube videos as educational tools. Articles exploring the use of video education specifically for surgeons in training were of interest for this review. All references in the selected studies were cross-referenced for inclusion if they were missed during the initial search. Duplicated data were excluded. Expert opinion articles, letters to the editor, short notes and conference notes were also excluded. Additionally, all studies that did not meet the aforementioned inclusion criteria were excluded.

Additionally, a specific search for YouTube and Plastic surgery was performed with the same search engines (PubMed, Cochrane Library, MedLine and Web of Science) using the same procedural guidelines. These searches were conducted until 9th May 2020 as well. All studies reporting on YouTube as an educational tool for plastic surgery were included.

Results

YouTube + surgery

For the search query, YouTube and surgery a total of 450 articles were identified in the original database search. After deleting duplicates, 247 unique articles remained for review. After screening the titles, 182 articles were considered irrelevant and were excluded. Abstracts of 65 studies were screened, and of these, 44 studies did not meet the inclusion criteria or did not evaluate our predefined endpoint and were excluded. Twenty-one articles were included in the full-text review. Based on the inclusion criteria, 11 articles were finally selected. The detailed selection process is shown in Figure 1. Of the 11 selected studies 10 evaluated the educational value of YouTube videos about one specific surgical procedure, one study explored the value for two related procedures (laparoscopic cholecystectomy and laparoscopic

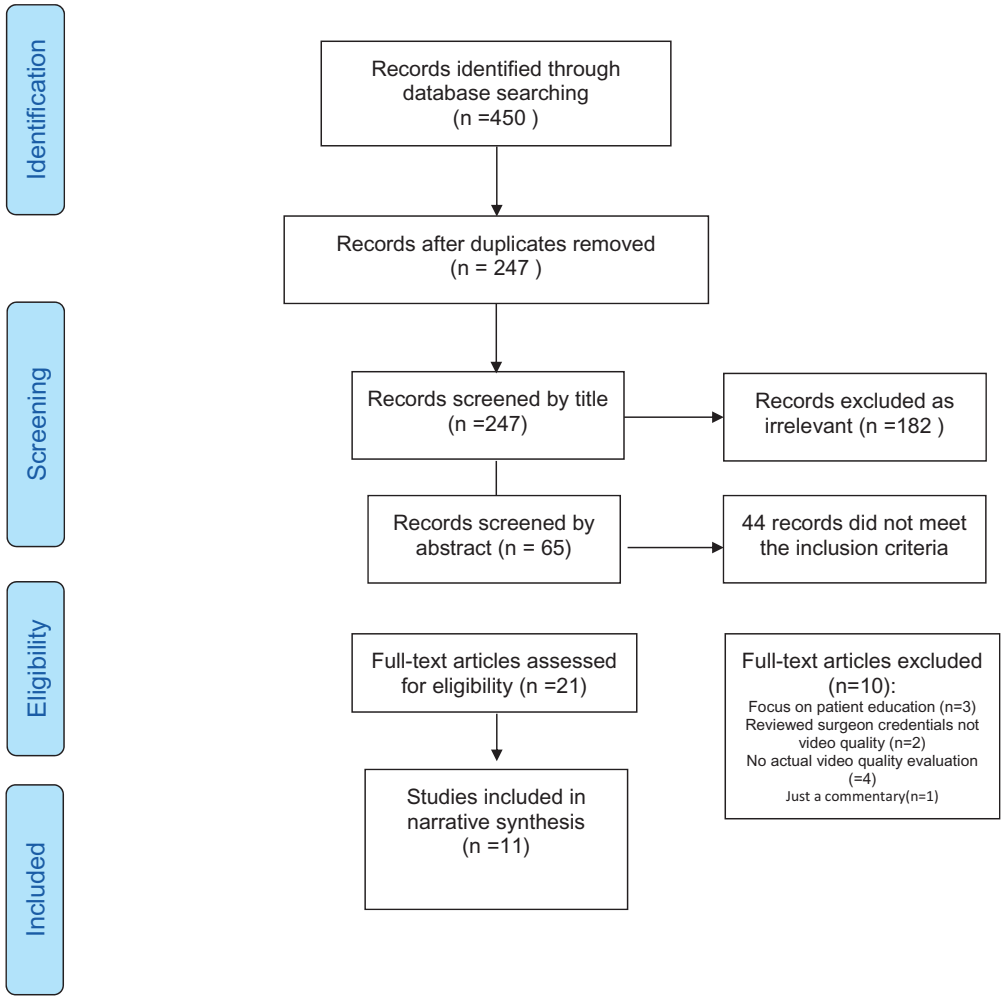

Figure 1. Search flowchart according to PRISMA guidelines.

Table 1. Summary of studies on the educational value of YouTube videos about surgical procedures.

Study	Year/ level of evidence	Quality evaluation of YouTube videos about:	No. of evaluated videos	Findings	Quality assessment tool	Recommendation
Is YouTube a potential training source for total extraperitoneal laparoscopic inguinal hernia repair (TEP) [28]?	2019/ 4	TEP	55	View counts of poor quality videos can be as high as for good quality videos	Scoring system developed by authors	Increase educational quality videos. Do not use not peer reviewed videos as an educational tool.
Educational value of surgical videos on transabdominal pre-peritoneal hernia repair (TAPP) on YouTube [29]	2020/ 4	TAPP	20	Most viewed videos 2019 do not conform to LAP-VEGaS and International Endohernia guidelines. Utility as surgical learning tools is questionable	LAP-VEGaS guidelines International Endohernia Society guideline	Surgical societies should support the creation and publication of good educational videos
Evaluation of surgical educational videos available for third year medical students [30]	2020/ 4	Laparoscopic cholecystectomy and laparoscopic appendectomy.	40	No video met all eight criteria from the ideal third year medical student educational video checklist	Checklist of eight criteria that were regarded as essential for an ideal surgical video	The created video checklist can be used as a guide for creating quality surgical educational videos in the future.
Educational assessment of the major lower limb amputations videos on YouTube [31]	2020/ 4	Lower extremity amputation (LEA)	13	Most videos were found to be of low-to-moderate quality	Assessment tool for limb amputations consisting of 11 items	High educational quality videos are needed to assist surgeons when planning and conducting LEAs.
Does YouTube include high-quality resources for training on laparoscopic and robotic radical prostatectomy [32]?	2019/ 4	laparoscopic and robotic radical prostatectomy (RP).	226	High-quality videos are available but there is no objective parameter to predict the educational quality of the videos.	Prostatectomy Assessment and Competency Evaluation (PACE) score	Development of structured and validated training programs is one of the main topics to be taken into consideration by the urologic community.
Assessing the educational quality of 'YouTube' videos for facelifts [16]	2019/ 4	Face lift	13	Majority of videos showed significant shortcomings in their preoperative, intraoperative, and post-operative content.	Thirteen intraoperative, pre/ postoperative, and video quality characteristics scored on a binary scale by three surgeons	Surgical trainees should implement discretion when choosing YouTube videos to complement their learning.
Transanal total mesorectal excision (TaTME): are we doing it for the right indication? An assessment of the external validity of published online video resources [33]						
Educational Quality of YouTube Videos on Knee Arthrocentesis [34]	2013/ 4	Knee arthrocentesis	13	Few videos appeared to be suitable for application in a Web-based format for medical students, fellows, and residents	Assessment of procedural technique and educational value with a 5-point global score, from poor to excellent educational quality.	Improvement of future video-based instructional materials on YouTube would be necessary before regular use for teaching could be recommended.
YouTube as a Potential Training Resource for Laparoscopic Fundoplication [35]	2016/ 4	Laparoscopic fundoplication	71	Varying degrees of quality. A process for filtering videos with high surgical and educational quality is feasible	Objective component rating scale, educational quality rating score, total video quality score	Alternative video platforms aimed at medical professionals should be considered for educational purposes
Viewer discretion advised: is YouTube a friend or foe in surgical education [15]?	2017/ 4	Laparoscopic cholecystectomy	10	Top ranked videos show suboptimal technique with half of videos demonstrating concerning maneuvers and only one in ten having an adequate critical view of safety.	GOALS score. CVS 'doublet view' score Additional screening for safety concerns not listed by the previous tools.	Critical analysis skills should be integral part of medical curriculum. Academic institutions and societies should promote and disseminate high-quality surgical videos.
Reliability and Educational Value of Laparoscopic Sleeve Gastrectomy Surgery Videos on YouTube [36]	2019/ 4	Laparoscopic sleeve gastrectomy (LSG)	90	43% of videos considered reliable. No relationship between reliability and views, likes, dislikes, resolution was found.	Evaluation of necessary surgical steps based on Delphi Consensus	Trainees are advised to search for peer reviewed contents that are dedicated to education.

(*continued*)

Table 1. Continued.

Study	Year/ level of evidence	Quality evaluation of YouTube videos about:	No. of evaluated videos	Findings	Quality assessment tool	Recommendation
Concerns of quality, utility, and reliability of laparoscopic gastrectomy for gastric cancer in public video sharing platform [37]	2019/ 4	LG for gastric cancer	102	Useful and appropriate educational tool. Video quality varied, and the level of information incompleteness was fairly high due to insufficient reviews	Video power index (VPI). Journal of American Medical Association (JAMA) benchmark criteria. The educational value and completeness were evaluated with a checklist developed by the researchers.	Surgeon trainers and surgical educators need to critically analyze the quality of video content and exercise responsibility in directing trainee surgeons. In the current era, it is best for trainees to search for peer-reviewed content.

appendectomy). The results of these studies are summarized in Table 1. Seven studies were performed in the field of gastrointestinal surgery, two in the field of orthopedic surgery, one in plastic surgery and one in urology. All studies were published rather recently (eight studies were published in 2019 or 2020, the oldest publication was from 2013). Six of these studies included a ranking towards the educational quality or usefulness of the screened videos while five used scores that analyzed quality or completeness of the surgical procedure assessed. The studies evaluated a total of 647 videos. Two hundred forty-six were included in the studies ranking towards the educational quality or usefulness. Among these 152 were deemed to have an educational value from good to fair. The rest was judged as poor or unreliable. All studies saw some educational value in YouTube videos for medical professionals however all studies also advised towards the danger of the varying quality of videos freely available making the need for a screening instrument (e.g. peer review) and the creation of more substantial educational video material apparent.

YouTube + plastic surgery

A total of 63 articles were identified in the original database search. After deleting duplicates, 31 unique articles remained for review. After screening the titles, 12 articles were considered irrelevant and were excluded. Abstracts of 19 studies were screened, and of these, after exclusion of non-relevant publications, six studies were fully assessed and evaluated. Of these, three studies reported specifically on YouTube's value for patient education, only two studies reported on its use for resident education and one paper addressed the educational value for both groups. The overall educational quality of evaluated videos was found to be inconsistent.

All but one study were published in 2019 or 2020. The results of these studies are summarized in Table 2.

Discussion

Celentano et al. found that 86.7% of surgical residents routinely watch online surgical videos and the most common sources are YouTube and websurg.com [12]. The benefit of video to demonstrate critical anatomy to surgical trainees has been demonstrated [13]. At the same time YouTube videos are available 24 h a day thus making them accessible even for busy surgical trainees and research has shown that group participation in video learning has shown to be both educational and enjoyable for residents [14]. The fact that anyone can upload videos on YouTube and refer to them as educational however holds a problem. A study looking at laparoscopic cholecystectomy videos on YouTube found that the highest-ranked videos displayed suboptimal technique and half of the videos showed unsafe maneuvers while only 10% demonstrated a satisfactory critical view of safety [15]. Trainees will need to isolate good-quality content from search results that return large amounts of inaccurate, incorrect or even unsafe information [16]. Especially in an early phase of training, a trainee might not be able to distinguish high-quality information from lower quality. In these cases, the abundance of available video content can lead to confusion and is essentially the time that could have been better spent. Also, key components of surgical knowledge such as indications, complications, and information regarding patient selection are oftentimes not sufficiently addressed in the available video content [10]. YouTube search results on a topic appear in order of popularity and viewer interaction, not in order of quality. In fact, a study by O'Connor et al. showed that publications

Table 2. Summary of studies on the educational value of YouTube videos about plastic surgery.

Study	Year/level of evidence	Focus group	No. of evaluated videos	Findings	Quality assessment tool	Recommendation
Patient information on breast reconstruction in the era of the world wide web. A snapshot analysis of information available on youtube.com [38]	2013/ 4	Patients	100	Videos do not provide comprehensive information	Three main information categories with subcategories were evaluated,	There is a need for validated, quality health information. There is certainly no substitute for a face to face discussion between healthcare providers and patients
YouTube for Cosmetic Plastic Surgery: An Effective Patient Resource [26]?	2019/ 4	Patients	173	Videos including US board-certified plastic surgeons were of significantly higher quality	DISCERN criteria	Plastic surgeons should be aware of YouTube as a resource and counsel patients about it. They should strive to upload high quality videos to provide more appropriate resources.
Can You Trust What You Watch? An Assessment of the Quality of Information in Aesthetic Surgery Videos on YouTube [20]	2019/ 4	Patients	523	The information contained in aesthetic surgery videos on YouTube is low quality.	Modified version of the Ensuring Quality Information for Patients criteria	Patients should be aware that the information has the potential to be inaccurate. Plastic surgeons should be encouraged to develop high-quality videos to educate patients.
Assessing the educational quality of 'YouTube' videos for facelifts [16]	2019/ 4	Trainees	See Table 1	See Table 1	See Table 1	See Table 1
YouTube and the Expanding Role of Videos in Dermatologic Surgery Education [24]	2012/ 4	Trainees	/	The number of videos will continue to grow. It is difficult to verify sources and the credentials of the video posters.	Descriptive	Clinicians and consumers should be aware of the source and intent of the video content before accepting the content.
Plastic Surgery on YouTube [25]	2020	Both	280	YouTube is an underutilized social media platform by plastic surgeons Educational videos are low in number and quality.	Descriptive	Plastic surgeons and institutions should utilize YouTube's expanding popularity and powerful reach for spreading awareness about plastic surgery-related safe practices and evidence-based data.

receiving the most media attention may not be the most scientifically rigorous [17]. This disparity between scientific impact and 'newsworthiness' combined with YouTube's video search order system might lead to a higher presence of video material with less scientific value especially on the first search result pages. In addition Shires et al. found that individuals with no thyroid surgery publication history posted the majority of YouTube videos on the topic including those in the first 100 results, these videos would thus be more likely to be viewed by surgical trainees [18]. This finding demonstrates a potential lack of evidence for these videos making retrieval of valuable educational information even harder. Of all the medical specialties, plastic surgery is the one most present on social media [19] which might be in part due to the obvious visual component of plastic surgery. But overall the quality of videos posted to YouTube regarding a wider variety of plastic surgical topics is poor [20]. As our review showed there are currently only few publications about the educational value of YouTube for plastic surgery. The majority of data available alludes to YouTube as a tool for patient education. Of the six evaluated articles about plastic surgery educational content on YouTube four studies evaluated videos that were at least in part addressed to patients. Ward et al. thus pointed out correctly that plastic surgeons should be aware of YouTube as a resource and counsel patients about it. They should strive to upload high-quality videos to provide more appropriate resources [21]. The studies included in our review addressed video content about aesthtetic surgery in three cases, breast reconstructive surgery, dermatologic surgery and one study assessed videos on a variety of plastic surgery subtopics. Educational video material on YouTube for trainees comes with the same drawbacks as it does for other surgical fields. The results of our review showed for example in a study about facelift videos on YouTube that these lack discussion of key tenets of successful facelift surgery. The authors suggest that until improvement in the educational quality of such material occurs, surgical trainees should implement discretion when choosing YouTube videos to complement their learning [16]. However, our review also demonstrated a need for evaluation tools to assess educational video quality. Four of the included publications relied on a descriptive, and thus not validated quality assessment. One study employed the DISCERN criteria from Charnock et al. [21] but this quality assessment tool was originally intended for written information, the same is true for the Ensuring Quality Information for Patients (EQIP) tool used by another of the evaluated papers [22].

Ben Naftali et al. analyzed the word 'plastic surgery' in 300 posts on YouTube; they found that only 13% of the published posts are by plastic surgeons [23] hinting further at the fact that plastic surgery content available on YouTube will often not be useful in an educational context. Koya et al. also point out that clinicians and consumers should be aware of the source and intent of the video content before accepting the content, of course, can be difficult at times [24]. But the fact that YouTube has a huge potential to be used as a powerful source to educate future surgeons cannot be denied. Almarghoub et al. suggest that plastic surgeons and institutions should utilize YouTube's expanding popularity and powerful reach for spreading awareness about plastic surgery-related safe practices and evidence-based data as educational videos on plastic surgery on YouTube currently have limited views (6%) with most of the videos being of low quality and uploaded from unaffiliated accounts [25]. As Rodriguez et al. stated: Critical analysis skills should therefore be an integral part of today's medical curriculum [15]. At the same time, plastic surgeons and academic plastic surgery organizations should strive to upload high quality, unbiased videos to provide more appropriate

resources [26]. First attempts to teach principles of plastic surgery and cosmetic surgery on a high-quality level are made for example by the Journal of Plastic and Reconstructive Surgery through providing regular freely available video content on different social media platforms, including YouTube and thus providing trainees with valuable, field-specific high-quality educational material [27]. These attempts prove the existing demand for high quality and ideally peer-reviewed online educational material for plastic surgeons that can be accessed 24/7. More educational material should thus be provided by certified specialists and addressing potential conflicts of interest will be of utmost importance to identify any biased materials funded by companies for example. Providing trainees with high-quality instructional videos is in the interest of every teaching institution.

Conclusion

YouTube videos are useful as supplementary tools in surgical education. The quality of available educational surgical video content varies widely and surgical trainees need to be critically aware of this. It should thus be in the interest of educational institutions to participate in sharing videos on this platform to improve the quality of the delivered information and thereby the educational experience of trainees. Plastic surgery is already omnipresent on social media which makes sharing valuable content for this surgical field especially important.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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