REVIEW

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Use of Youtube in Medical Education

ABSTRACT
The use of technologies is gradually increasing in undergraduate, postgraduate and continuing medical education. The internet has become not only an easily accessible resource for health services but also the biggest and latest source of medical knowledge. In this framework, Web 2.0 sites such as YouTube have become useful sources of information, and they are widely used by medical students as a learning resource. Educators should promote the use of YouTube particularly as a self-guiding method to enhance students' learning. YouTube provides an affordable and useful communication tool that students can access at any time. We believe that YouTube will continue to provide the skills and information needed in the learning processes in undergraduate and postgraduate medical education in the future as well.

Keywords: YouTube, Medical, Education, Medical Education

Tıp Eğitiminde Youtube Kullanımı

ÖZET
Lisans, lisansüstü ve sürekli tıp eğitiminde teknolojilerin kullanımı giderek artmaktadır. İnternet sadece sağlık hizmetleri için kolay erişilebilir bir kaynak değil, aynı zamanda en büyük bilgi kaynağı haline gelmiştir. Bu çerçevede, YouTube gibi Web 2.0 siteleri yararlı bilgi kaynakları haline gelmiştir ve tıp öğrencileri tarafından bir öğrenme kaynağı olarak yaygın şekilde kullanılmaktadır. Eğitimciler, öğrencilerin öğrenmesini geliştirmek için, özellikle kendi kendine rehberlik yöntemi olarak YouTube'un kullanımını teşvik etmelidir. YouTube, öğrencilere her zaman erişebilecekleri uygun ve kullanışlı bir iletişim aracı sağlar. YouTube'un gelecekte de mezuniyet öncesi ve mezuniyet sonrası tıp eğitiminde öğrenim süreçlerinde ihtiyaç duyulan bilgi ve becerileri sağlamaya devam edeceğine inanıyoruz.

Anahtar Kelimeler: YouTube, Tıp, Eğitim, Tıp Eğitimi

INTRODUCTION

Medical education is changing rapidly, as it is affected by many factors such as the developments and changes in health service delivery, globalization, the internet, population diversity, the changing role of physicians, changing social expectations, rapidly changing medical science and the diversity of pedagogical techniques. The use of technologies is gradually increasing in undergraduate, postgraduate and continuing medical education, and the use of technology has been developing for years. This inclination towards the use of technology has developed as a response to the challenges experienced particularly in medical education. The aims of using technology in medical education include facilitating basic learning, improving decision making, improving skill coordination, making clinical decisions in rare or critical cases, learning teamwork and improving psychomotor skills. It is possible to achieve these aims through different technologies. Podcasts and videos, mobile devices with apps, video games, simulations (part-time trainers, integrated simulators, visual reality) are a few examples of current technological advancements. The use of computer technologies has the advantage of evaluating competencies and providing the necessary tools to continue lifelong medical learning. In addition, the use of technology in medical education should support learning (1). The internet has become not only an easily accessible resource for health services but also the biggest and latest source of medical knowledge. In this framework, Web 2.0 sites such as YouTube have become useful sources of information, and they are widely used by medical students as a learning resource. Easily accessible visual-auditory files both enhance patient knowledge and affect medical education. However, very little is known about their characteristics. Easily accessible video-posting sites such as YouTube are the internet applications that are commonly used by medical students and residency students. YouTube gives an opportunity for educational purposes. Since 2005, YouTube has been acknowledged as an important platform for sharing information. However, the quality and accuracy of online medical information is very heterogeneous. Inaccurate or misleading health information can appear on YouTube. YouTube is an important resource for different diseases and procedures (2). Considering that YouTube access can accelerate the learning of clinical procedures, it is important to enhance its scope and access to support student needs in addition to basic education (3). YouTube reaches billions of users and is a unique source of information dissemination and communication. It is a "participatory culture" site, where contributors upload a great variety of content from entities, enterprises and individuals (4). It is a resource of popular video blogs and short original videos uploaded by individuals. Most of the videos on YouTube are based on personal experience, but there are also many videos posted by professionals such as physicians. Diversity of authorship and lack of preliminary examination on YouTube may lead to misleading health information (5,6). Despite this, social media is widely used by patients and interns as an educational tool (7, 8, 9, 10). Doubtlessly, new technologies change the way students learn as well as the strategies used for designing and implementing medical and health curricula. Considering those changes, there are a series of technological tools that can promote learning for medical students. For example, network sites (Facebook and Twitter), media sharing sites (for example, YouTube and Flicker), blogs, wikis, podcasts and iTunes U can help users in discovering and downloading visual and auditory content. These online applications are built on contents posted by users and known as Web 2.0 (11). YouTube is the biggest online video site, where videos are viewed by more than 100 million viewers every day (12).

This study aims to examine the importance of using YouTube in medical education, the studies on the use of YouTube in medical education, and the advantages and disadvantages of using YouTube.

STUDIES REGARDING USE OF YOUTUBE IN PRECLINIC EDUCATION

Use of Youtube In Teaching Anatomy

In the last decades, the way in which anatomy is taught and its resources have evolved significantly. One of these resources has been videos, and their role in anatomy education has developed with technological advancements. Successfully integrated anatomy videos are important for the curricula. Students watch and use these videos as a highly important resource for revision and preparation for examinations (13). The use of YouTube in medical education has remodeled and enhanced the teaching and learning of anatomy. A study conducted on 91 second-year medical students assessed the effectiveness of YouTube videos. According to its results, 98% of students used YouTube videos that emphasized applied aspects of anatomy as an online information resource, albeit in different frequencies. Based on these findings, YouTube can be considered as an effective tool to enhance anatomy education if the videos are scrutinized, diversified, and aimed toward course objectives (14). A survey made with first-year medical students at a medical school in Venezuela showed that 85% of them used YouTube as an online information resource to study human anatomy. 82.5% of them considered that human anatomy videos were a positive tool to learn human anatomy (15). Barry et al. surveyed second-year undergraduate medical and radiation therapy students (n=73) regarding their use of online social media in relation to anatomy learning and reported

that the majority of students used YouTube as their primary source of anatomy-related video clips (16). YouTube is an evolving platform for learning human anatomy as it is an easy-access and free service. Raikos and Waidyasekara made a quantitative and qualitative analysis of the human heart anatomy videos available on YouTube. In the study, the authors analyzed 294 videos. They used a scoring system to assess the anatomical quality and details, general quality, and the general data for each video. The results indicated that the human heart anatomy videos available on YouTube conveyed anatomical criteria poorly and that the general quality score was borderline (17).

Another study screened YouTube videos covering surface anatomy. For each video, information was collected on its title, authors, duration, number of viewers, posted comments, and total number of days on YouTube. Videos were grouped into educationally useful and non-useful videos. A total of 235 YouTube videos were screened, and 57 were found to have relevant information to surface anatomy. According to the results, 27% of the videos provided useful information on surface anatomy, while 73% of the videos were not useful educationally. The total average viewership per day was 750 for useful videos and 652 for non-useful videos. There were no video clips covering surface anatomy of the head and neck, blood vessels and nerves of upper and lower limbs, chest and abdominal organs/structures (18).

USE OF YOUTUBE IN TEACHING CLINICAL SKILL-RELATED TOPICS

Use of Youtube In Teaching Heart Sounds and Murmurs

Camm et als'study aiming to assess the quality of videos relating to heart sounds and murmurs contained on YouTube hypothesized that the quality of video files purporting to provide education on heart auscultation would be highly variable and screened related videos. Their YouTube search found and scored 22 suitable videos. According to the results, the average score was 4.07 out of 7; 6 videos scored
5.5 or greater; and 5 videos scored 2.5 or less. In addition, there was no correlation between video score and YouTube indices of preference, and the quality of videos was highly variable (19).

Using Videos On YouTube For Surgical Preparation

The study by Rapp et al. questioned participants regarding the frequency and helpfulness of videos, video sources used, and preferred methods between videos, reading, and peer consultation to evaluate the surgical preparation methods of medical students, residents, and faculty with special attention to video usage. Survey participants included fourth-year medical students pursuing general surgery, general surgery residents, and faculty surgeons in the Department of Surgery. A total of 86 surveys were distributed, and 78 surveys were completed. It was found that 90% of respondents reported using videos for surgical preparation; the most used source was YouTube (% 86); and learners and faculty used different video sources (20).

Use of Youtube In Teaching Physical Examination of The Cardiovascular and Respiratory Systems

In a study analyzing YouTube videos about physical examination of the cardiovascular and respiratory systems, three assessors searched YouTube for videos covering the clinical examination of the cardiovascular and respiratory systems. For each video, information was collected on the title, authors, duration, number of viewers, and total number of days on YouTube. The three assessors rated the videos independently and grouped them into educationally useful and non-useful videos. According to the results, there were 56 videos covering the examination of adults; of these, 20 were relevant to cardiovascular examinations and 36 to respiratory examinations. Further analysis revealed that 9 provided useful information on cardiovascular examinations and 7 on respiratory examinations. The other videos (11 on cardiovascular and 29 on respiratory examinations) were not useful educationally. The study concluded that a small number of videos about physical examination of the cardiovascular and respiratory systems were educationally useful; these videos can be used by medical students for independent learning and by clinical teachers as learning resources (21).

Use of Youtube In Teaching Cardiopulmonary Resuscitation and Basic Life Support

Another study aimed to analyze the videos on the YouTube video sharing site, noting which points addressed in the videos related to CPR and BLS, based on the 2010 Guidelines for the American Heart Association (AHA). The relevant videos on You Tube (n=61) were analyzed. They were mostly posted by individuals, and most of them were under the older 2005 guidelines, despite being added to the site after the publication of the 2010 AHA Guidelines, (22). Yaylacı et al. investigated the reliability and accuracy of the information on YouTube videos related to CPR and BLS according to the 2010 CPR guidelines. The authors examined the sources that uploaded the videos, the recording time, and the number of viewers in the study period. They rated the videos based on their display of the correct order of resuscitative efforts according to the 2010 CPR guidelines. Then, they analyzed the 209 videos meeting the inclusion criteria after the search in YouTube with four search terms, namely 'CPR', 'cardiopulmonary resuscitation', 'BLS' and 'basic life support'. They found that only 11.5% of videos were compatible with the 2010 CPR guidelines with regard to the sequence of interventions. Videos uploaded by 'Guideline bodies' had significantly higher rates of download when compared with the videos uploaded by other sources (23).

Duncan et al. evaluated 100 YouTube sites, approximately 1500 minutes or 25 hours' worth of content across 10 common clinical skill-related topics to assess the quality of clinical skills videos available on YouTube. The authors viewed 10 videos on YouTube for each topic. They found that the topic with the biggest number of both postings and views was cardiopulmonary resuscitation (CPR). Only one video out of the 100 analyzed could be categorized as 'good'. 60% of the CPR content was categorized as 'satisfactory' (24).

Use of Youtube In Teaching ECG Diagnosis

Akgun et al. assessed the videos relating to ECG diagnosis on YouTube. Videos were assessed for usefulness, source and characteristics. The authors assessed the usefulness of videos using a checklist they developed. They included 119 videos in the analysis. They found that 56 videos were very useful and that 16 videos were misleading. Videos grouped as very useful videos comprised 90% of those uploaded by universities/hospitals and 45% of those uploaded by individuals. They found that the ratio of the misleading information in ventricular tachycardia videos was 42.9%. The results of this study indicated that ECG information on YouTube was not satisfactory (2).

Videos About Thermal Burn First Aid On Youtube

Butler et al. evaluated the clinical accuracy and delivery of information on thermal burn first aid on YouTube. Two independent reviewers scored the videos using a standardized scoring system and the scores were totaled to give each video an overall score out of 20. 47 videos were analyzed. This study concluded that videos covering thermal burn first aid available on YouTube were unsatisfactory. Its recommendation was that the organizations involved in managing burns and providing first aid care should be encouraged to produce clear, structured videos (25).

USE OF YOUTUBE IN TEACHING SYSTEMS

Use of Youtube In Teaching Nervous System

Azer et al. assessed the videos covering the nervous system examination on YouTube. The authors collected the title, author/s, duration, number of viewers, number of posted comments, and total number of days on YouTube for each video. Videos were rated independently by three assessors and grouped into educationally useful and non-educationally useful videos. According to the findings, 129 videos had relevant information to the nervous system examination; 47% of videos provided useful information on the nervous system examination; while 53% videos were not useful educationally. This study reported that YouTube provided an adequate resource for learning the nervous system examination for medical students, but that there were deficiencies in videos covering examination of the cerebellum and balance system (26).

Use of Youtube In Teaching Cardiovascular Mechanisms

Azer assessed the contents of YouTube videos on cardiovascular mechanisms and examined 29 YouTube videos. That study found that 16 of those videos were educationally useful while 13 videos were not educationally useful, and concluded that You-Tube videos were deficient in cardiovascular mechanisms (27).

Pant et al. assessed the credibility of YouTube video information on acute myocardial infarction by exploring the relationship between accuracy of information on the topic, source of expertise, and perceived credibility of the message. They categorized videos according to the source of the video. They analyzed content for discussing different aspects of the disease, ranging from pathophysiology to treatment. They found that only 6% of the videos touched upon all aspects of acute myocardial infarction. They reported that only 17% of the videos discussed the preventive aspects of the disease and stressed weight-loss and exercise programs, while very few videos stressed other risk factors (28).

Use of Youtube In Teaching Anorexia- Related Misinformation Disseminated

Syed- Abdul at al. investigated anorexia-related misinformation disseminated through YouTube videos. Three doctors reviewed 140 videos with approximately 11 hours of video content, classifying them as informative, pro-anorexia, or others, and the 40 most-viewed videos (20 informative and 20 pro-anorexia videos) were assessed to gauge viewer behavior. According to the results, pro-anorexia videos were favored 3 times more than informative videos (29).

Use of Youtube In Teaching Hip Arthritis

Koller et al. analyzed 133 YouTube videos on hip arthritis in terms of accurate information. They developed two quality assessment checklists with a scale of 0 to 12 points to evaluate available video content for diagnosing and treating hip arthritis. They grouped videos into poor quality (grade 0-3), moderate quality (grade 4-7) and excellent quality (grade 8-12), respectively. Three independent observers assessed all videos using the grading system and independently scored all videos. According to the results, 84% of videos had a poor diagnostic information quality, 14% a moderate quality and only 2% an excellent quality; 86% of videos had a poor treatment information quality, 11% a moderate quality and only 3% an excellent quality (30).

USE OF YOUTUBE IN TEACHING CLINICAL INTERVENTION

YouTube Videos On Knee Arthrocentesis

The study by Fischer et al. assessed the educational value of YouTube videos on knee arthrocentesis posted by health professionals and institutions. Two independent clinical reviewers assessed videos for procedural technique and educational value using a

5-point score, ranging from 1 = poor quality to 5 = excellent educational quality. According to the findings, 13 videos met the inclusion criteria. The most popular video had 1,388 hits per month, 8 videos were considered useful for teaching purposes, and 6 videos demonstrated full sterile conditions. At least two thirds of videos were considered useful for teaching purposes, but while some videos had a high educational quality, an improvement of most of the YouTube videos on knee arthrocentesis was recommended (31).

Lumbar Puncture (LP) and Spinal Anesthesia (SA) Videos On YouTube

In a retrospective study assessing the quality of lumbar puncture (LP) and spinal anesthesia (SA) videos available on YouTube, Rössler et al. evaluated the videos using essential key points (5 in SA, 4 in LP) and 3 safety indicators. They evaluated the violation of sterile working techniques and rated whether the video should be regarded as dangerously misleading. They evaluated 38 eligible videos. They found that 56% of SA videos contained 2–4 key points, while 19% did not contain any essential information. They reported that even though high quality videos were available, the quality of video clips was generally low. Although the fraction of videos with aseptic working techniques was low, these posed a substantial risk to patients, and that consequently, more high-quality, institutional medical learning videos should be made available (32).

Male Urethral Catheterization (UC) Videos On Youtube

Nason et al. aimed to assess the quality of YouTube as an educational tool regarding male urethral catheterization (UC) and to assess the experience of newly qualified doctors regarding UC. The authors identified 49 eligible videos. They found that, regarding the Safe Catheter Insertion Score, the mean score was 5.18 ± 1.64. Nine videos (18.4%) were deemed useful, 24 (49%) somewhat useful and 16 (32.7%) not useful. There was no difference in the number of views, duration of video or number of days online between those videos. Out of 26 interns, 21 completed the survey and reported that the video was a useful educational adjunct (33).

USE OF YOUTUBE IN PATIENT EDUCATION

Stellefson et al. conducted a content analysis of chronic obstructive pulmonary disease (COPD) patient education videos on YouTube. Two independent coders evaluated each video to determine the topics they covered, media source(s) of posted videos, information quality as measured by HONcode guidelines for posting trustworthy health information on the internet, and viewer exposure/engagement metrics. The study found that more than half of the videos included information on medication management, while there were very few videos on smoking cessation. The study findings suggested that COPD education via YouTube had the potential to reach and inform patients but that existing video content and quality varied significantly (34).

In Sood et als' study examining the effective use of YouTube as an information source on kidney stone disease, two physicians watched relevant videos and classified them as useful, misleading, or personal experiences. Total viewership, duration, rating, days since upload, source, and information content were noted. According to the results, 199 videos had relevant information about nephrolithiasis, 58.3% of the videos had useful information, and 18.1% were misleading. Useful videos had 47.2% of total viewership share, whereas misleading videos had 2.8%, so there was a statistically significant difference in viewership/day and rating among useful videos vs misleading videos (6).

USE OF YOUTUBE IN COUNSELING

Use of Youtube In Teaching Cigarette and Hookah-Related

Carroll et al. compared the characteristics of and messages conveyed by cigarette- and hookah-related videos on YouTube. The authors detected 66 cigarette-related and 61 hookah-related videos. They found that median view counts were 606,884 for cigarette-related videos and 102,307 for hookah-related videos, and that the number of comments per 1000 views was significantly lower for cigarette-related videos than for hookah-related videos (35).

YouTube Videos on Infantile Spasms

Fat et al. assessed YouTube videos for their efficacy as a patient resource for infantile spasms. Two neurologist raters assessed the technical quality, diagnosis of infantile spasms, and suitability as a teaching resource using the Medical Video Rating Scale. Mean rating for technical quality was 4.0 out of 5 for rater 1 and 3.9 out of 5 for rater 2. Raters found 60% and 64% of videos to accurately portray infantile spasms, respectively. Ten videos were considered excellent (36).

USE OF YOUTUBE IN PREVENTION

Use of Youtube In Teaching The Human Papillomavirus (HPV) Vaccine

In a study making a content analysis of YouTube videos related to the human papillomavirus (HPV) vaccine, the authors examined 172 YouTube videos with respect to video sources, tones, and viewer responses. They found that most of these videos were news clips or consumer-generated content. They reported that the majority of the videos were negative in tone and disapproved of the HPV vaccine, and that negative videos were liked more by the viewers than positive or ambiguous ones (37).

USE OF YOUTUBE IN MASTER LEVEL

Another study explored how master's students (of occupational therapy) perceived the use of YouTube videos in the kinesiology course. The videos, taken on a smartphone, were uploaded to a

private YouTube URL created by the instructor and then linked to a pre-established Moodle learning platform. According to the post-course survey results, students perceived that the videos improved the quality of the course and increased their level of engagement and learning (38).

STUDIES ABOUT VIDEO LENGTH AND INFORMATION QUALITY

Buzetto-More investigated student perceptions and preferences regarding the implications of YouTube videos. According to the findings, the use of YouTube in the teaching and learning process enhances instruction. In addition, the study found that video length had an impact on student decisions regarding whether or not to watch a video, and that course delivery format impacted length and audio preferences (39).

THE ADVANTAGES AND LIMITATIONS OF USING YOUTUBE IN MEDICAL EDUCATION

YouTube has become an increasingly important resource for people to meet their needs for additional information regarding their medical conditions. YouTube can increase out-of-class learning opportunities and particularly promote self-regulatory learning (40). In addition, YouTube enables students to access the videos that they can use in their learning process all the time and everywhere (41). Today, medical students and assistants use technological opportunities frequently. If technology is used properly, it has the potential to make a big impact on medical education, but it can also cause harm if there are no recommendations on which resources will be used or how they will be used (42). Use of YouTube to exchange personal and professional information among university students is rapidly growing. In terms of medical education, YouTube is very important for enhancing the teaching-learning experiences of medical educators, physicians, librarians and students in a rich environment of networking and collaboration. YouTube videos focus students' attention and allow them to interact and thus include them in their own training. YouTube allows students to compare and analyze the perspectives of several videos and promotes critical thinking (43). Another questionable advantage of YouTube is that it makes distance training possible (41). Educators should promote the use of new technologies, choose the educational videos enhancing critical thinking for students, and use them in group studies. When YouTube is used for clinical education, it has a promising potential as a lifelong learning tool (44). Azer compared the contents of medical textbooks, eMedicine (Medscape) topics, and YouTube videos on cardiovascular mechanisms and found that they were also ideal for the molecular and clinical integration of contents and information. The author found that YouTube provided up-to-date and understandable education resources for medical students and increased interaction among users through user comments and feedback (27). However, despite all its benefits, there are problems to be addressed. One of them is that students can often be confused as to where to look for knowledge because there has been a recent overcrowding of YouTube (45). In today's world, the internet and social media are a part of everyday life. One of the most frequently used social media sites is YouTube, which was created in 2005 and now has over one billion users. Social media has great potential to provide easy access to medical information. Social media can help close the health literacy gap and present information in new ways that allow even illiterate populations to learn. However, with this increased opportunity, the chances also increase for the dissemination of inaccurate and even harmful information (46). With the rise of Web 2.0, the sharing of information on medical conditions by patients spreads through home videos, forums and blogs on the internet. Uploading home videos online has gained popularity since the creation of YouTube in 2005, and now numerous videos can be found online. Thus, it is easy to access information, and particularly YouTube can be the first source of information for patients. There are an increasing number of studies that detail the effect of YouTube on health services. Their topics include health promotion, disease perception and dissemination of proper health information (36). YouTube content is an attractive combination of active and didactic methods as a platform for learning skills or discussion. Medical students prefer web-based learning to conventional lecture-based classes because of its ease of use, accessibility, high medical image quality and repeated application advantage (31). Using YouTube can promote students to think about the materials in a medical curriculum. Students can have online discussions and make comments on videos in a familiar environment. In terms of feedback, the "insights" analytical tool of YouTube provides useful statistical data on the use of videos. These statistics relate to the viewing frequency in a certain time period, regional popularity, user demographics and how people mention videos. Such statistics are effective in making plans for future videos and providing a retrospective perspective for evaluating videos (14). YouTube is accepted as an important platform for sharing information and patient education because it is popular, easy to access and free (18). As in many health-related sources of information on the internet, online videos are not generally peer reviewed and the quality of information is variable (25). Another disadvantage is the high probability that YouTube videos will give wrong messages indirectly to people.

CONCLUSION

We recommend educators to explore the idea that YouTube will continue to provide the

skills and information needed in the learning processes in undergraduate and postgraduate medical education in the future as well. Therefore, we recommend educators to explore YouTube particularly as a self-guiding method to improve students' learning, as YouTube provides a communication environment that is affordable, useful, accessible at all times, and familiar to students.

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