




# Video-based digital platforms as an educational resource for the surgical preparation of orthopedic surgeons

Hakan Zeybek<sup>1\*</sup> , Hakan Cici<sup>2</sup> , Ali Ihsan Kilic<sup>3</sup> 

## SUMMARY

**OBJECTIVE:** The aim of the study was to research the video-based digital platforms that orthopedic specialists in Turkey use as an educational resource in their surgical preparations that they have not seen or done before, the frequency of their use of these platforms, and their trust in these platforms, with a survey study.

**METHODS:** The importance of video-based digital platforms in surgical preparations that surgeons have not seen or done before was measured using the data obtained from 181 orthopedic specialists using a survey prepared on an Internet-based server (docs.google.com).

**RESULTS:** Orthopedists used video-based digital platforms with a ratio of 38.7% among the educational resources in their surgical preparations that they have not seen or done before. There was no significant difference between the specialists with a surgical experience of 1–10 years and more than 10 years of experience in terms of using video-based digital platforms in surgical preparation ( $p>0.05$ ). A total of 81.2% of the participants used only video-based digital platforms in the preparation of a surgical procedure they have never seen before. The most frequently used digital platform was YouTube, and 62% of the participants considered these platforms reliable.

**CONCLUSION:** Orthopedic specialists in Turkey primarily and frequently use video-based digital platforms as a training resource in their preparations for surgery that they have not seen or done before. The establishment or support of platforms with evidence-based content with references from official orthopedic institutions and organizations can increase the trust of orthopedic specialists in these platforms.

**KEYWORDS:** Learning. Audio-video demonstration. Teaching materials.

## INTRODUCTION

The master-apprentice model that has been traditionally used in the training of orthopedic surgeons is a matter of debate at present. The training concepts of the past are based on the blending of theoretical knowledge acquired from textbooks and medical journals with practical training in the operating theater<sup>1</sup>. However, the increased use of portable electronic devices and easier access to the Internet have made it possible for the field of Internet-based surgical learning to expand.

The accelerating effect of the coronavirus 2019 (COVID-19) pandemic led to a new transformation in the models for training orthopedic residents with online training resources as an alternative to face-to-face training<sup>2</sup>. Video-based digital platforms (VBDPs) are an important component in online training resources, and they make a positive contribution to the understanding and practical performance of residents, especially at the stage of surgical preparation<sup>3</sup>. It is already known that not only residents preparing to be surgeons but also orthopedic specialists on a lifelong learning path benefit from YouTube, VuMedi,

and similar VBDPs<sup>4</sup>. However, the main prediction requiring investigation is that the “see one, do one, teach one” principle of Sir William Halsted, which has traditionally been one of the foundation stones of surgical training, has been changed to the current interpretation of “watch one, do one”<sup>5</sup>. In this respect, it can be considered worth investigating the tendency of orthopedic specialists to benefit from VBDPs in surgical preparation for procedures they have not seen or done before.

The continuous development of new techniques and indications for minimally invasive orthopedic surgery, primarily arthroscopy, has resulted in a knowledge burden that is difficult to cope with<sup>6</sup>. The sharing on digital platforms of high-quality videos taken in the operating theater provides the opportunity for cases to be seen from the hands of surgeons who are experienced and knowledgeable on the subject<sup>7</sup>. Some of these VBDPs undoubtedly include evidence-based, high-quality training videos, which can show the source<sup>8</sup>. However, there are also VBDPs hosting videos of surgical interventions that have a high number of views but require the indications and reliability to be confirmed.

<sup>1</sup>Izmir Katip Celebi University, Ataturk Training and Research Hospital, Department of Orthopaedics and Traumatology – Izmir, Turkey.

<sup>2</sup>Izmir Demokrasi University, Buca Seyfi Demirsoy Training and Research Hospital, Department of Orthopaedics and Traumatology – Izmir, Turkey.

<sup>3</sup>Bakircay University, Cigli Training and Research Hospital, Department of Orthopaedics and Traumatology – Izmir, Turkey.

\*Corresponding author: hakanzeybekmd@gmail.com

Conflicts of interest: the authors declare there is no conflicts of interest. Funding: none.

Received on April 18, 2023. Accepted on April 28, 2023.

The aim of this questionnaire-based study was to investigate which training sources are used by orthopedic specialists in Turkey to prepare for a surgery that they have not seen or performed before and, especially, how often they use VBDPs and the reliability of the VBDP sources.

## METHODS

Permission to conduct this questionnaire-based study was obtained from the Ethics Committee of Izmir Katip Celebi University. A questionnaire was prepared with 14 closed-ended items and 14 forced and multiple-choice items using a free Internet-based resource ([www.docs.google.com](http://www.docs.google.com)). To reach the maximum possible number of participants, the link to this questionnaire was sent to an e-mail group that included only orthopedic specialists and orthopedic residents ([turk-ortopedi@googlegroups.com](mailto:turk-ortopedi@googlegroups.com)). To prevent the participants from completing the questionnaire more than once, the Internet protocol (IP) was restricted.

The first section of the questionnaire recorded the demographic data of age, the institution where they are working, and the duration in the profession (i.e., resident, specialist for 1–10 years, and specialist for >10 years). In the following section, questions related to the training sources they tended to use in preparation for surgeries they had rarely or never performed before, and the reliability of the VBDP were asked.

After the termination of the data collection procedure, the opinions of 235 orthopedic specialists and residents who agreed to participate in the study and who worked in university hospitals, state hospitals, or private hospitals in Turkey were recorded. The data of 54 residents were excluded from the analysis, and 181 orthopedic specialists were included in the analysis.

### Statistical evaluation

Data obtained from the respondents were analyzed statistically using the SPSS version 20.0 software. Continuous data were presented as mean±standard deviation (SD) values and categorical data were presented as numbers (n) and percentages (%). The  $\chi^2$  test was used in the comparisons of categorical data, and Fisher's exact test was used when the data did not meet the  $\chi^2$  test requirements. A value of  $p < 0.05$  was considered statistically significant.

## RESULTS

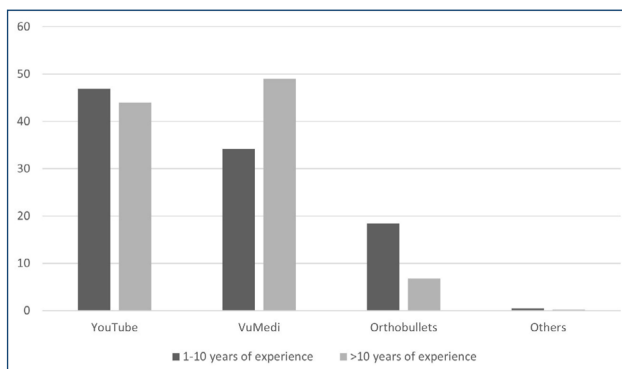
The evaluation was made from the data of 181 orthopedic specialists with an average age of  $43 \pm 8.7$  years. As the database was recorded after the full completion of the questionnaires by the respondents, the response rate was 100%. Of the total

respondents, 53.6% (n=97) worked in university and training hospitals, 27.6% (n=50) in state hospitals, and 18.2% (n=33) in private hospitals. The duration of working in the profession as an orthopedic specialist was reported to be 1–10 years as a specialist by 44.8% (n=81) of the respondents and >10 years as a specialist by 55.2% (n=100).

The resources from which the respondents benefitted when preparing for a surgery that they had rarely or never seen or performed before are shown in Figure 1. The orthopedic specialists reported that they first benefitted from VBDPs (n=70, 38.7%), surgical approach books (n=49, 27.1%), textbooks (n=31, 17.1%), and literature research (n=15, 8.3%). Verbal consultations were defined as a priority by 16 (8.8%) respondents.

The data related to the frequency that the respondents used training resources on the subject before cases of orthopedic surgery that had not seen/performed before are shown in Table 1. Of the total respondents, 66.3% (n=120) benefitted from VBDPs, 65.2% (n=118) from surgical approach books, 57.5% (n=104) from textbooks, 45.3% (n=82) from literature research, and 30.4% (n=55) from verbal consultations before each surgery they had not seen/performed before. The rates of taking no benefit from these training resources varied between 1 and 9%. The specialists with 1–10 years of experience benefitted from literature research, and those with more than 10 years of experience took relatively more benefit from textbooks and surgical approach books, but the difference was not statistically significant ( $p > 0.05$ ). No statistically significant difference was determined between the two groups of specialists according to experience in respect of the rates of benefit taken from VBDPs and verbal consultations ( $p > 0.05$ ).

Of the total orthopedic surgeons in the study, it was reported by 81.2% (n=147) of surgeons who had never seen a surgical intervention and by 66.9% (n=121) who had seen a



**Figure 1.** The percentages of resources from which the respondents benefitted when preparing for a surgery that they had rarely or never seen or performed before.

**Table 1.** The frequency of training resources that the respondents used on the subject before cases of orthopedic surgery that had not seen/performed before.

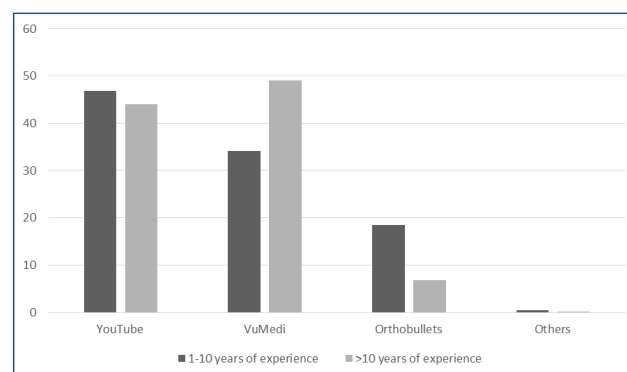
Educational resources	Average number of years in practice	Never n (%)	Sometimes n (%)	Always n (%)	p-value	Cramer's V
Textbooks	1–10 years	3 (3.7)	36 (44.4)	42 (51.9)	0.235	0.127
	>10 years	1 (1)	37 (37)	62 (62)		
Literature search	1–10 years	6 (7.4)	32 (39.5)	43 (53.1)	0.165	0.141
	>10 years	9 (9)	52 (52)	39 (39)		
Approach books	1–10 years	4 (4.9)	26 (32.1)	51 (63)	0.269	0.120
	>10 years	1 (1)	32 (32)	67 (67)		
Verbal consultation	1–10 years	2 (2.5)	52 (64.2)	27 (33.3)	0.545	0.0819
	>10 years	5 (5)	67 (67)	28 (28)		
Video-based digital platforms	1–10 years	2 (2.5)	24 (29.6)	55 (67.9)	0.877	0.0381
	>10 years	2 (2)	33 (33)	65 (65)		

surgical intervention but not performed it themselves that they performed such a surgical intervention only with the benefit taken from VBDPs. The digital platform most often used in surgical preparation by all the specialists was determined to be YouTube at the rate of 45.3% (n=82). Between the two groups according to experience, VuMedi was used significantly more (49%) by the surgeons with more than 10 years of experience, and Orthobullets was used significantly more (18.5%) by the surgeons with 1–10 years of experience ( $p<0.05$ ) (Figure 2).

Of the videos they watched on VBDPs with the aim of surgical preparation, 62% of the respondents reported that they considered the videos reliable, 28.5% stated that they were not much reliable, and 3.4% found them unreliable. In response to the question of the need for surgical training videos on the popular social/medical digital platforms of national and international orthopedic professional associations, 80.7% (n=146) of the respondents definitely agreed that they were necessary, 16% (n=29) stated that they may be necessary, and 2.2% (n=4) considered that they were not necessary.

## DISCUSSION

The results of this study clearly showed that VBDPs are one of the most important training resources from which orthopedic surgeons in Turkey benefit when preparing for surgical procedures that they have not previously seen or performed. Moreover, the training resource from which surgeons with different durations of professional experience benefitted from most often as a priority when preparing for surgery that they had previously not seen or performed was again these platforms. That the VBDPs were preferred first in surgical preparation is because these resources have different advantages as a component of

**Figure 2.** The usage of digital platforms according to experience of orthopaedic surgeons benefitted when preparing for a surgery that they had rarely or never seen or performed before.

the electronic learning model<sup>9</sup>. Due to the printing process of printed materials, textbooks and surgical approach books tend to have the problem of not being up-to-date in surgical training, which is an area that undergoes continuous development and change. In contrast, VBDPs can be rapidly updated and accessed. With the combination of written, visual, and audio stimuli, a surgical training video can present a procedure in a more understandable way<sup>8</sup>.

It has been previously shown in the literature that video-based learning is more effective than print media for better learning and understanding of complex surgical procedures<sup>10</sup>. It is also known that watching a surgical training video before performing a surgical procedure for the first time significantly reduces error rates and shortens the operating time<sup>11,12</sup>. In the development of the surgical knowledge and skills of orthopedic specialists, there are various alternative and effective programs such as training courses and industry-funded events<sup>13</sup>. However, personal participation in these programs has disadvantages in

the sense of both time and money, whereas training videos prepared in these programs, especially surgical preparation related to cadaver dissection that the surgeons have not previously seen or performed, can be accessed through VBDPs at a more convenient time and place.

The benefit of surgical preparation from literature resources such as systematic reviews or meta-analyses, or primary, focused research articles remains as important and frequent as the benefit from VBDPs<sup>14</sup>. However, according to the results of this study, more than half of the orthopedic specialists do not always research the literature on surgical preparation for a procedure they have not previously seen or performed. Although literature resources provide undoubtedly valuable theoretical information about the indications of a disease, the surgical procedure, and outcomes, the lack of video content related to the surgical procedure in most of them may lead to insufficient demand for these resources. Verbal consultations are often used, but this is a training model about which there has been very little examination in the literature<sup>15</sup>. Social media has become a more effective and easy-to-use means of communication for many surgeons from the same branch to participate in verbal consultations<sup>16</sup>. However, according to the results of this study, surgeons do not use this training model as a priority when preparing for surgeries that have not previously seen or performed. Although the recommendations from experienced surgeons in these groups are valuable for surgical preparation, a surgical procedure that is to be performed for the first time can probably be learned more easily from a video.

Supporting the results of this study, YouTube is known to be the most frequently used VBDP in surgical preparation throughout the world<sup>4</sup>. However, as videos can be uploaded to this platform with open access without showing the source, this creates a huge doubt in respect of the provision of current surgical standards. It has been previously shown that the educational value of videos on this platform is low for both patient

information and medical training related to the field of orthopedics<sup>17-19</sup>. Although there are recommendations for showing the source of videos or for the development of a scoring system for reliability, it is clear that the current scoring system does not go beyond the common sense of the viewer<sup>4</sup>. In this study, the surgeons did not give high-reliability scores when asked about if the reliability of the VBDPs supports this disadvantage.

Despite the high response rates and consistent results obtained from the orthopedists, there were some limitations to this study. There may have been some bias due to the respondents marking different response options for a question they did not wish to answer. Moreover, when the number of respondents is taken into consideration, the results may not represent all orthopedic specialists either in Turkey or throughout the world.

## CONCLUSION

The results of this study demonstrated that orthopedic specialists in Turkey primarily and frequently use VBDPs as a training resource in preparation for surgical procedures that they have not previously seen or performed. Similar to that in other educational models in medicine, platforms with evidence-based content and showing the source, which are established or supported by official orthopedic institutions and associations, would be beneficial to disseminate accurate and reliable up-to-date information.

## ETHICAL APPROVAL

File Number: 20.10.2022/0458.

## AUTHORS' CONTRIBUTIONS

**HZ:** Conceptualization, Data curation, Formal Analysis, Writing – original draft. **HC:** Formal Analysis, Writing – review & editing. **AIK:** Data curation, Writing – review & editing.

## REFERENCES

1. Weglein DG, Gugala Z, Simpson S, Lindsey RW. Impact of a weekly reading program on orthopedic surgery residents' in-training examination. *Orthopedics*. 2015;38(5):e387-93. <https://doi.org/10.3928/01477447-20150504-55>
2. Raja BS, Choudhury AK, Paul S, Rajkumar S, Kalia RB. Online educational resources for orthopaedic residency-a narrative review. *Int Orthop*. 2021;45(8):1911-22. <https://doi.org/10.1007/s00264-021-05101-6>
3. Friedl R, Höppler H, Ecard K, Scholz W, Hannekum A, Ochsner W, Stracke S. Multimedia-driven teaching significantly improves students' performance when compared with a print medium. *Ann Thorac Surg*. 2006;81(5):1760-6. <https://doi.org/10.1016/j.athoracsur.2005.09.048>
4. Rapp AK, Healy MG, Charlton ME, Keith JN, Rosenbaum ME, Kapadia MR. YouTube is the most frequently used educational video source for surgical preparation. *J Surg Educ*. 2016;73(6):1072-76. <https://doi.org/10.1016/j.jsurg.2016.04.024>
5. Kotsis SV, Chung KC. Application of the "see one, do one, teach one" concept in surgical training. *Plast Reconstr Surg*. 2013;131(5):1194-201. <https://doi.org/10.1097/PRS.0b013e318287a0b3>
6. Pioger C, Harly É, Rattier S, Blancheton A, Looock E, Grob C, et al. French arthroscopic society. arthroscopy training in france: a resident perception and self-assessment. *Orthop Traumatol*

- Surg Res. 2019;105(8S):S397-402. <https://doi.org/10.1016/j.otsr.2019.09.013>
7. Glass NE, Kulaylat AN, Zheng F, Glarner CE, Economopoulos KP, Hamed OH, et al. A national survey of educational resources utilized by the Resident and Associate Society of the American College of Surgeons membership. *Am J Surg.* 2015;209(1):59-64. <https://doi.org/10.1016/j.amjsurg.2014.09.016>
  8. Pape-Koehler C, Immenroth M, Sauerland S, Lefering R, Lindlohr C, Toaspern J, et al. Multimedia-based training on internet platforms improves surgical performance: a randomized controlled trial. *Surg Endosc.* 2013;27(5):1737-47. <https://doi.org/10.1007/s00464-012-2672-y>
  9. Jayakumar N, Brunckhorst O, Dasgupta P, Khan MS, Ahmed K. e-Learning in surgical education: a systematic review. *J Surg Educ.* 2015;72(6):1145-57. <https://doi.org/10.1016/j.jsurg.2015.05.008>
  10. Friedl R, Höppler H, Ecard K, Scholz W, Hannekum A, Stracke S. Development and prospective evaluation of a multimedia teaching course on aortic valve replacement. *Thorac Cardiovasc Surg.* 2006;54(1):1-9. <https://doi.org/10.1055/s-2005-865871>
  11. Cook DA, Garside S, Levinson AJ, Dupras DM, Montori VM. What do we mean by web-based learning? a systematic review of the variability of interventions. *Med Educ.* 2010;44(8):765-74. <https://doi.org/10.1111/j.1365-2923.2010.03723.x>
  12. Satterwhite T, Son J, Carey J, Zeidler K, Bari S, Gurtner G, et al. Microsurgery education in residency training: validating an online curriculum. *Ann Plast Surg.* 2012;68(4):410-4. <https://doi.org/10.1097/SAP.0b013e31823b6a1a>
  13. Wolf BR, Britton CL. How orthopaedic residents perceive educational resources. *Iowa Orthop J.* 2013;33:185-90. PMID: 24027481.
  14. Rogers MJ, Zeidan M, Flinders ZS, Presson AP, Burks R. Educational resource utilization by current orthopaedic surgical residents: a nation-wide survey. *J Am Acad Orthop Surg Glob Res Rev.* 2019;3(4):e041. <https://doi.org/10.5435/JAAOSGlobal-D-19-00041>
  15. Pemberton, P. Joint consultations revisited: getting to the point. *Educ Primary Care.* 2008;19(4):408-15. <https://doi.org/10.1080/14739879.2008.11493705>
  16. Koparal M, Ünsal HY, Alan H, Üçkardeş F, Gülsün B. WhatsApp messaging improves communication in an oral and maxillofacial surgery team. *Int J Med Inform.* 2019;132:103987. <https://doi.org/10.1016/j.ijmedinf.2019.103987>
  17. Fischer J, Geurts J, Valderrabano V, Hügler T. Educational quality of YouTube videos on knee arthrocentesis. *J Clin Rheumatol.* 2013;19(7):373-6. <https://doi.org/10.1097/RHU.0b013e3182a69fb2>
  18. Rössler B, Lahner D, Schebesta K, Chiari A, Plöchl W. Medical information on the internet: quality assessment of lumbar puncture and neuroaxial block techniques on YouTube. *Clin Neurol Neurosurg.* 2012;114(6):655-8. <https://doi.org/10.1016/j.clineuro.2011.12.048>
  19. Wong M, Desai B, Bautista M, Kwon O, Kolodychuk N, Chimento G. YouTube is a poor source of patient information for knee arthroplasty and knee osteoarthritis. *Arthroplast Today.* 2018;5(1):78-82. <https://doi.org/10.1016/j.artd.2018.09.010>

