



Online educational resources for orthopaedic residency—a narrative review

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Abstract

Purpose Residency programs in the medical education field are considered the keystone in the development of aptitude and skills required for practice. With the worldwide current scenario of the COVID-19 pandemic, there has been a shift in the paradigm especially in the teaching of the residents from face-to-face classes to more and more online sessions. The purpose of this study is to present a compendium of knowledge-providing sites, smartphone applications (apps), YouTube channels, and podcasts that can provide better online resource management for students in the field of orthopaedics.

Methods Search terms were used for making a list of various online resources which can be of help during orthopaedic residency. An initial list of the selected websites, smartphone apps, podcasts, and YouTube channels was made. The corresponding author with years of teaching experience and faculty for post-graduate and fellowship training programs then selected the final list.

Results A list of 16 websites with brief points on their content and online address along with the availability of free or paid content was identified as being appropriate. A total of 39 apps available for android/apple smartphones, nine podcasts, and 11 YouTube channels were also identified as being extremely useful and have been discussed elaborately in this article.

Conclusion Online educational tools are of immense importance in imparting adequate knowledge to an orthopaedic resident and act as an adjunct to conventional teaching methods. This article focuses on presenting various online educational resources in a simple yet concise way, which may be beneficial for the current generation of residents especially in this current time of unprecedented COVID-19 pandemic.

Keywords Online tools · Websites · Smartphone apps · Podcasts · YouTube channels · Orthopaedic residency · Educational resources

Introduction

Residency programs in the medical education field are considered to be the keystones in the development of aptitude and skills required for practice. The education that residents or students imbibe during their residency ushers them forward to face the difficulties that they may encounter in the future and prepares them with problem-solving skills. Various methods of teaching exist in the curriculum [1]. These may be face-to-face classes, didactic lectures, group discussions, webinars, or conferences [1]. The years one needs to spend in a residency program differs from country to country but the essence of education remains the same [2]. The coronavirus disease-2019 (COVID-19) pandemic without a doubt has created a big hole in the residency programs all over the world with restrictions imposed in the form of social distancing and curtailment of routine surgery

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[3–6]. Face-to-face classes and case presentations have seen a drastic decrease in usage limiting the student's learning opportunities [3, 7, 8]. Moreover, the decreased volume of surgery has also made hands-on training and learning more difficult [8, 9].

With the current scenario of the COVID-19 pandemic, there has been a shift in the paradigm especially in the teaching of the residents [10, 11]. Earlier, face-to-face interaction was considered the gold standard for medical education, and the need for maintaining up-to-date knowledge in the field was made possible by subscription to various online specialty-specific journals [12]. The skills needed for surgery were obtained from assisting surgeries first-hand and learning from the masters. Other than these, learning from seminars, journal clubs, hands-on training in cadaveric labs, and surgical skill labs were the usual norm in various surgical residency programs [12, 13]. Recently, online educational tools and platforms such as Google Meet, Microsoft Teams, and Zoom have been increasingly used for knowledge sharing and the faculty, as well as the residents alike, are using these platforms extensively [14]. Although face-to-face educational activities remain valuable [15], there has been consensus about spreading infections during these serious times. Online tools such as websites with resources relevant to orthopaedics [16], podcasts, smartphone applications (apps), and YouTube channels are all good sources of information and study material for the budding residents [8, 17, 18]. With the vast number of sites, apps, and varied options available online, it is difficult to select the one with good content, usefulness, and functionality.

Orthopaedics is the branch that deals with the diseases of the bones and soft tissues in general. Just as in other specialties, orthopaedics also lays special emphasis on the education of residents. The invention of smartphones and the easy accessibility of the internet over the past few decades have increased the availability of resources that one can access for study [19]. The sheer number of sites and resources makes it difficult to choose and decreases the probability for the residents and budding surgeons to identify the ones with quality and usefulness. The purpose of this study is to present a compendium of knowledge-providing sites, smartphone apps, YouTube channels, and podcasts that can provide better resource management and be valuable for students in the field of orthopaedics.

Materials and methods

The study was conducted over three months from November 2020 to January 2021. The roles of the authors were defined before the study was conducted. The first and second authors were responsible for the initial search and preliminary list development. The third and fourth authors were involved in

the final selection which was reviewed by the fifth author. Four online resources were searched for orthopaedic content and their usefulness. These included the online websites with orthopaedic information useful for residents, smartphone apps that have tools helpful for residents, podcasts that focus on academics, and YouTube channels that had videos on orthopaedic topics and surgical procedures. The inclusion criteria used were English language as the communicating medium, resources directed for orthopaedic learning, videos of surgical exposure or implants, and lectures. Online resources that focused on patient education were excluded.

The search term used for online websites was “orthopaedics” AND “learning” in the Google search engine with advanced search settings kept as language – English, region – any region, last update – anytime, terms appearing – in link to the page, show explicit results, file type – any type and usage type – not filtered by license. The resources searched that were directed with an aim for academics or can be used as an educational tool for orthopaedics residents were selected. The smartphone apps were searched in the Google Play Store and the App Store for iPhone. The search terms used in combination were Orthopaedic/Orthopedic(s), orthopaedic surgery, musculoskeletal, bones, and fracture. The apps searched were listed with a focus on their content, functionality, rating, and tools available for academics or surgical planning. Podcasts were searched in iTunes, Google Play Music, and Spotify with search terms “Orthopaedic/Orthopedic(s) podcasts”. Podcasts that shared educational resources were selected. YouTube was also searched for channels that are dedicated to academics and learning surgical skills in orthopaedics using the search terms “orthopaedics learning/orthopaedics”, “orthopaedic surgery”, and “academics in orthopaedics”. Those channels with less than three thousand subscribers were excluded. Contents of these YouTube channels were scrutinized based on patient education specific or surgeon/resident directed. Only channels with educational materials related to orthopaedic surgery catering to the interests of a physician or trainee residents were included.

An initial list of the selected websites, smartphone apps, podcasts, and YouTube channels was made. The third and fourth authors who are part of post-graduation and fellowship programs then selected the final list, which was reviewed and approved by the fifth author. The data were collected in Microsoft (MS) Excel sheet initially and due to the descriptive nature of the current study, no comparative analysis was considered.

Results

The online search of websites delivered 27,900 results. An initial list of 489 websites that had orthopaedic resources was made and out of this, 13 sites were chosen. Three sites

that were not obtained in the initial search results were added by a manual search, making a total list of 16 websites (Fig. 1). The complete list of the websites with a brief point on their content and address along with the availability of free or paid contents is presented in Table 1.

The search for smartphone apps in the Google Play Store and Apple Store delivered 41 and 129 results, respectively. Out of these, 53 apps were selected for the initial list. The final list was then subsequently selected and contained a total of 39 apps. Table 2 describes the apps available in smartphones or iPads that residents can take advantage of in learning key concepts.

The podcasts search delivered a total of 22 results. The final list contained nine podcasts which are detailed in Table 3. The total number of results during YouTube search could not be calculated as search results in YouTube do not show the volume. A thorough search was done using the criteria and an initial list of 30 channels was made. The final list after a thorough review gave 11 results. These are listed in Table 4.

Discussion

The COVID-19 pandemic has brought forward an unexpected dilemma in the field of medical education especially in the surgical branches. The influx of a large number of COVID-19 patients into the health care setup had led to an overburden on the existing medical infrastructure. Moreover, with the need to limit the social interaction between individuals, the residency programs have been compelled to reinvent themselves to continue imparting quality learning experiences to the residents. Pertinent to human character, the need for improvisation leads to the development of newer methods to impart training. The medical education field is dynamically changing to adapt to the new normal. Alternative modes of education and the use of online resources for the betterment and knowledge sharing are being increasingly adopted.

A large number of orthopaedic websites [16] are often one click away and are easily available using smartphones and laptops or on personal computers. With the widespread

Fig. 1 Flowchart showing the search process for selecting online websites

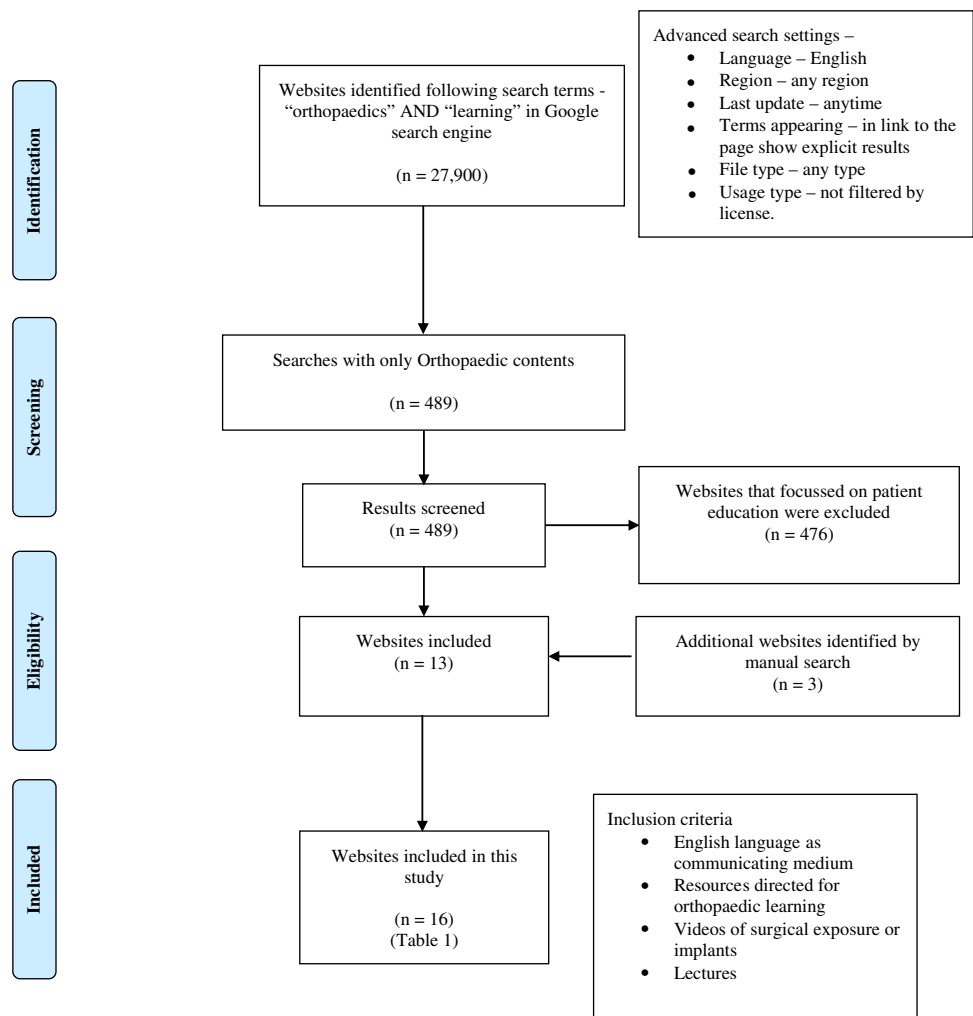


Table 1 List of various websites catering orthopaedic knowledge

Sl. no	Address	Description	Paid/free
1	https://www.orthobullets.com/	<ul style="list-style-type: none"> • A free online learning website • Comprehensive knowledge on various orthopaedic topics including anatomy, pathology, basic sciences, trauma, joint reconstruction, arthroscopy, paediatrics, foot and ankle, hand and techniques for surgery • Provides MCQs on various topics for premium members • User-friendly with up-to-date knowledge and attractive design <p>New additions:</p> <ul style="list-style-type: none"> • PEEK (a personalised adaptive learning system) • PASS (a teaching evaluation and reporting platforms for academic institutions)-for premium users 	Free Premium membership (paid) required for MCQs and advanced features
2	https://www.wheelsonline.com/	<p>An online orthopaedics textbook presented by Duke University Medical Centre's Division of Orthopaedic Surgery delivers</p> <ul style="list-style-type: none"> • Basic knowledge on various orthopaedic topics and disaster preparedness • Well structured • Quality of the data not suited to everyone's style • Insufficient videos and pictures • Good references for further study 	Free
3	http://www.orthoteers.com/	<ul style="list-style-type: none"> • Commercial website • Excellent source for knowledge for the residents and practicing physicians alike • Large variety of topics, which includes anatomy to advanced topics including multiple specializations with detailed explanations • Provides for the paid customers the option for MCQs and courses including FRCS Orth training, trauma skills, and multidisciplinary clinical examination course • Well-designed and comprehensive with authority • However, the cost of membership may deter many and topics need to be updated 	£58.75 for 1 year
4	https://orthopaedicprinciples.com	<ul style="list-style-type: none"> • A unique website focused on academics • Enriches basics knowledge from anatomy to super speciality • Talks and presentations from prominent faculty made available free of cost for easy learning • The site navigation: simple with first class content and updated on a regular basis • Allows the users to post questions to the editors, promptly answered • For the postgraduates and budding surgeons, gives links for the available training programs active at present and MCQs are free 	Free
5	http://www.instantanatomy.net/	<ul style="list-style-type: none"> • Provides basic anatomy about muscle origin and insertion • Good pictorial representations of joints, muscles, nerves, blood vessels, and surface anatomy • Discrepancy in the data 	Free

Table 1 (continued)

Sl. no	Address	Description	Paid/free
6	http://www.bartleby.com/107/	<ul style="list-style-type: none"> • Online version of Grey's anatomy • Free website for studying bone or muscle or nerve anatomy • The interface is not user-friendly 	Free
7	http://www.netanatomy.com/	<ul style="list-style-type: none"> • An educational website that addresses radiographic anatomy, cross-sectional anatomy, and gross anatomy • Available through an institutional subscription only 	Paid
8	https://www.aaos.org/	<ul style="list-style-type: none"> • Website of American Association of Orthopaedic Surgeons • Provides a wide range of tools and online resources • Offers evidence-based guidelines for the majority of orthopaedic conditions <p>Provides options on career centre and orthopaedic calendar</p> <ul style="list-style-type: none"> • Options for online learning and orthopaedic video theatre given 	Learning tools are for a premium
9	https://www.vumedi.com/	<ul style="list-style-type: none"> • A video education platform • Free to use with simple user interface • Provides videos (lecture) on all orthopaedic topics of relevance, multiple surgical technique videos • Freshens up basic knowledges and updates 	Free
10	https://aotrauma.aofoundation.org/	<ul style="list-style-type: none"> • The AO Foundation • Excellent interface for the viewers • Provides knowledge regarding the orthopaedic surgical exposures, techniques, and the implants • Excellent-quality pictures and the videos: a boon to the residents and the surgeons alike • Up-to-date knowledge on implants and procedures to a particular bone • Provides details of the various academic courses it has to offer along with an online peer learning resource for the interested 	Free
11	https://global-help.org/	<ul style="list-style-type: none"> • Free online medical library focused on child health • Offers excellent resource materials, acclaimed articles and videos on various paediatric orthopaedic topics from trauma, evaluation, infections, management, tumours, neuromuscular diseases, sports injuries, and rehabilitation • User-friendly interface and well-organised content 	Free

Table 1 (continued)

Sl. no	Address	Description	Paid/free
12	https://jbjs.org	<ul style="list-style-type: none"> • The <i>Journal of Bone & Joint Surgery</i> website • Information with evidence-based numerous articles • Easily accessed and viewed • Offers a plethora of options to the budding orthopods with JBJS reviews, JBJS case connector, JBJS surgical techniques and JBJS open access journals • The JBJS clinical classroom is an online adaptive learning program, focuses on 10 orthopaedic subspecialties in the areas of sports medicine, adult hip reconstruction, adult knee reconstruction, spine, shoulder and elbow, hand and wrist, foot and ankle, paediatrics, basic sciences, and pathology and ethics 	299\$ for clinical classroom
13	https://journals.lww.com/clinorthop/pages/default.aspx	<ul style="list-style-type: none"> • Clinical Orthopaedics and Related Research® • Publication of The Association of Bone and Joint Surgeons® • Vast number of articles in the orthopaedic specialities • Simple interface with accessible archives 	Free
14	https://www.jnjmedicaldevices.com/en-EMEA/companies/depuy-synthes#ourportfolio	<ul style="list-style-type: none"> • Website of Johnson and Johnson • Multiple operative techniques and videos • Implant details and brochures 	Free
15	https://www.arthrex.com/	<ul style="list-style-type: none"> • Official website of the Arthrex company • Techniques, surgical videos, implant brochures, and recent articles • Knowledge on orthobiologics 	Free
16	https://www.orthoracle.com/	<ul style="list-style-type: none"> • Online e-learning surgery atlas • Full of practical information validated for surgeons and residents • High-resolution images of various orthopaedic procedures, details on the steps starting from disease overview, indications, setup, operative techniques, postoperative protocol, implants, and results • Costly 	7 euros/month

Words in bold type indicate special salient points of the websites

usage of internet facilities around the world, it has become easier for residents to access these websites within a few moments. This kind of electronic resource utilization has been seen throughout other specialized branches of medicine [20] as well as surgical [21] residents, indicating the recent trend of incorporation of technology in learning. Unlike the situations in the past where the residents need to consult a senior or need to visit the library to enhance his/her knowledge, it has become a lot more easier and effective method to look in these sites for information. The study by Sherman et al. [22] revealed that 44.9% of the online educational contents were easily accessible through an internet search. It was also shown by Rogers et al. that Orthobullets has a very high rate of usage (99.5%) among their study subset of residents [17]. A lot of websites have resources for orthopaedic training but only a select few have high quality

with an excellent interface, user-friendly nature, design, and functionality. Websites like Orthobullets, Orthopaedic principles, AOtrauma foundation website, VuMedi, and Global Health.org all have an excellent user interface and high-quality material that act as adjuncts to the resident training programs [17].

The invention of smartphones has revolutionized the scenario of education and the present generation of residents are more technologically advanced and can easily access the content on the internet [19]. There exist numerous apps that residents can access for e-learning. The functionality of these apps exceeds far more than the websites. There exist apps which one can measure angles, plan surgeries, learn about anatomy, learn academics, keep one updated with recent articles and implant details, etc. But, there are concerns regarding the content and validity of the information

Table 2 List of various smartphone applications (apps)

Sl no	Applications	Platform	Functionality	Paid/free
Applications useful for measurement of angles				
1	CJ Ortho	Mac/iPhone/iPad/Android	Goniometer tool, tool for fracture classification, tool for clinical scores for joints and data storage	Free
2	Angulus: Measure angles on images/videos	Android	Tool for angle measurement	Free
3	Scoliguage	Mac/iPad/iPhone	Tool for angle measurement	0.99\$
4	Angle Meter 360	Mac/iPad/iPhone	Tool for angle measurement	Free
Applications useful for surgical planning in orthopaedics				
5	PeekMed®	Mac/PC/iPad	Tools for osteotomy, templating, planning and fracture reduction	Paid
6	Surgimap	Mac/iPhone/iPad Android	Tool for viewing patient database and images, tool for measurement and planning surgery	Free
7	mediCAD	PC/Mac/web browsers	Tool for measurement, angle calculation, planning and various templates especially in total joint replacement. It also has tools for deformity correction and 3D printing	Paid
8	TraumaCad Mobile	iPad	Tools to plan total joint replacement. Tools for measurement of angles and length	Free
9	Bone Ninja	iPad	Tool for preoperative planning of osteotomies and limb reconstruction	\$49.9 Or Rs.4499
Applications useful for academics in orthopaedics				
10	AO Surgery Reference/Clinical (technique guide)	AS/PS	It provides the residents with accurate knowledge regarding the fractures of all the bones, its AO classification, and the treatment Moreover, the app provides detailed knowledge regarding the surgical exposures, the tips for fracture reduction, the implants need to be used, and their rationale	Free
11	CORE – Clinical Orthopedic Exam*/Clinical (exam)	iPad/iPhone/PS	An excellent app to study the clinical examination in orthopaedics. It provides users with more than 200 clinical tests and their references	39.9\$ or Rs.3499/-
12	Essential Anatomy 5	AS	A tool to learn the anatomy of human body. It offers annotations and clear texts	Paid
13	Grey's anatomy	AS	Excellent app for learning anatomy	Free
14	Bullets	AS and PS	App from Orthobullets website	Free, but modules paid
15	iOrtho*/Clinical (exam)	AS/PS	It focuses on the clinical examination in orthopaedics. Numerous test which are described along with references, supported with images, videos and statistics	Paid
16	Conceptual orthopedics	AS/PS	An app for learning academics. It offers multiple videos and lectures on basic and advanced topics in orthopaedics	Paid
17	OrthoGuidelines (AAOS)	PS and AS	Guideline recommendations by orthopaedic disease, specialty, keyword, strength of evidence, and/or stage of care	Free
18	Skeletal System Pro III	iPad/iPhone	An anatomy-based app which provides 3D models with tools for identifying each muscle, bone, nerve, and artery. It also provides cross-sectional anatomy and videos demonstrating various surgical procedures and common pathologies	AS: \$9.99
19	MSK Radiology 4 U	iPhone/iPad	Case-based teaching of the musculoskeletal radiology	Paid

Table 2 (continued)

Sl no	Applications	Platform	Functionality	Paid/free
Applications useful for fracture classification				
20	Fracture Classification HD	AS/PS	Helps in fracture classification	Paid
21	AO/OTA Fracture Classification	AS/PS	Tool helpful in classification of fractures. It contains numerous images and X-rays which would be helpful	Free
22	Fracture Classification (FC)	AS/PS	Tool helpful in fracture classification	Free
23	Ortho Traumapedia	AS/PS	An interesting app for the residents which offers basic knowledge regarding bones, fractures, dislocations and treatment Simple user friendly interface allows users to quickly access the contents	Paid
24	RealWorld Orthopaedics	AS	App for musculoskeletal radiology	Paid
Applications useful for learning surgical skills				
25	RealWorld Procedures	iPad/iPhone	Simple tutorials for procedures The app provides videos for a limited number of orthopaedic procedures that a resident or budding surgeon can find useful	Free
26	AAOS Access	AS/PS	An app to access an entire video content of AAOS. The list encompasses almost all of the specialities	Free
27	ICUC	iPad	Case-based scenarios for orthopaedic trauma. The user can have access to library of cases, reference cases, and expert opinions. The app allows users to download the material which can help in surgical training and preventing the mistakes	Free
28	BoneDoc	iPhone/iPad	An interactive and educational orthopaedic surgery tool which helps in simulating orthopaedic surgery. A methodological approach can be studied by the residents	\$1.99
Applications useful for patient education				
29	My Knee Guide	iPad/iPhone	A resource useful for patients undergoing total knee replacement. It provides the users with real-world stories, expectations, and the requirements that patients need to follow each day	Free
30	myHip&Knee	iPad/iPhone	Helps in patient education post-surgery	Free
31	Arthrosurface	iPad	A resourceful app which helps patients understand normal and abnormal knee kinematics. Helpful for patients with knee pathologies	Free
32	PhysioMed	iPad/iPhone	An app with a focus on physiotherapy. There are multiple injuries listed and the physiotherapy protocol is devised based on rationale The exercises list encompasses almost all exercises and images and links to videos are also present for patient education	Free
33	ASSH Hand.e	AS (iPad)/PS	Contains text on various topics of the upper extremity with focus on diagnosis, treatment and the overall management	Free
Applications useful for implant details				
34	Acumed	iPad	Techniques, videos, implant details available	Free
35	Arthrex surgeon app	AS and PS	Techniques, videos, implant details available	Free
36	DePuy Synthes	iPad/iPhone	Techniques and implant details	Free
37	zbinetwork	iPad/iPhone	Techniques, implant details, and list of courses offered	Free
38	Stryker Op Tech Live	iPad/iPhone	Techniques and implant information	Free

Table 2 (continued)

Sl no	Applications	Platform	Functionality	Paid/free
39	Orthofix ABS	iPad	Treatment options for various fractures	Free

AS, Apple Store; PS, Google Play Store

Table 3 List of online podcasts

Sl. no	Address	Content	Address
1	White Coat Coaching Orthopedic Residency Advice	<ul style="list-style-type: none"> • Made for undergraduate students by ortho residents • Built to empower next generation of orthopods • There are 28 interviews to date, which would help the students to understand orthopaedics in a better way from multiple perspectives 	https://whitecoatcoaching.com/podcasts/
2	Ortho Eval Pal Optimizing Orthopedic Evaluations and Management Skills	<ul style="list-style-type: none"> • Paul Marquis P.T delivers the podcast • Focused on orthopaedic evaluation and management skills for various scenarios • It has 168 clippings as of now 	https://www.buzzsprout.com/325448
3	BJJ Podcasts 24	<ul style="list-style-type: none"> • Offers exclusive interviews from authors of the selected papers published in the BJJ • Subscription through iTunes 	https://online.boneandjoint.org.uk/bjj/podcasts
4	The Orthobullets Podcast	<ul style="list-style-type: none"> • Podcast from bullets team • Contains more than 500 voice recordings pertaining to orthopaedic conditions and their management 	https://www.orthobullets.com/Site/Podcasts/PodcastsList?p=2
5	Ankle Surgery Update	<ul style="list-style-type: none"> • A podcast aimed to keep listeners updated about the recent advancements in the field of ankle surgery 	https://anklesurgeryupdate.buzzsprout.com/
6	Foot and Ankle Orthopaedics	<ul style="list-style-type: none"> • Official podcast channel of American Foot and Ankle society • Multiple recordings to make listeners understand the recent advancements and rationale of procedures 	http://footandankle.sage-publications.libsynpro.com/
7	SAGE Orthopaedics <i>The American Journal of Sports Medicine</i>	<ul style="list-style-type: none"> • Podcast from SAGE for orthopaedics • Provides recordings on the recent articles published by the publisher 	http://sageorthopaedics.sage-publications.libsynpro.com/
8	JBJS Podcast	<ul style="list-style-type: none"> • It provides the highlights of recent issues of JBJS 	https://jbjs.org/media.php
9	Arthroscopy Podcast Library	<ul style="list-style-type: none"> • From The Journal of Arthroscopy and Related surgery • Short radio recordings listing the recent articles published in the journal 	https://www.arthroscopyjournal.org/podcast-archive-2020

shared. It is upon the user to ascertain whether the information provided is credible or not. One can use these apps based on the publisher's reputation. The apps of the AAOS, Orthobullets, and surgical planning apps such as Surgimap, MediCAD, TraumaCad, AO group, Stryker, Acumed, and Arthrex are of special mention wherein the details are trustworthy [17, 23–25].

Similar to smartphone apps, YouTube has become the medium of sharing videos. As high as 86% of the respondents suggested they were most commonly used in the study

by Rapp et al. [26]. Also, video-based education has been emphasized for surgical training [27] and the effectiveness of YouTube as a surgical teaching tool has been already described [28]. One can access the videos of seminars, lectures, surgical exposure videos, and various surgical techniques according to their need. Hence, it would be very useful for the residents to refer to these selected channels for gaining adequate knowledge and information whenever required.

Table 4 List of various important YouTube channels

Sl. no	Name	Address	Usefulness	Subscribers	Paid/free
1	Nabil ebraheim	https://www.youtube.com/user/nabilebraheim/playlists	<ul style="list-style-type: none"> • Excellent channel to learn about orthopaedic topics including fractures and anatomy of bone • Useful for surgeons and residents alike to brush up their knowledge 	557 k	Free
2	Orthopaedic Principles	https://www.youtube.com/c/OrthopaedicPrinciple/videos	<ul style="list-style-type: none"> • Channel dedicated for orthopods • Contains videos and lectures with focus on recent advancements in the field of orthopaedics • Covers almost all the topics necessary for residency program 	16.7 k	Free
3	Husky Orthopaedics	https://www.youtube.com/user/HuskyOrthopaedics/videos	<ul style="list-style-type: none"> • The University of Washington Department of Orthopaedics and Sports Medicine channel boasts of multiple videos mostly of upper limb • Provides videos that can assist in career guidance 	10.6 k	Free
4	Pediatric Orthopedic	https://www.youtube.com/user/Pediatricorthopedic/videos	<ul style="list-style-type: none"> • Contains around 45 videos as of now • Excellent source of knowledge for the residents and surgeons alike for paediatric orthopaedic related conditions 	13.2 k	Free
5	Don Bufford, MD, RMTSK	https://www.youtube.com/user/donbuffordmd/videos	<ul style="list-style-type: none"> • The channel provides videos on arthroscopy procedures in knee and shoulder • Provides the owners experience with orthobiologics, stem cells, and PRP 	3.57 k	Free
6	Robert la Prade	https://www.youtube.com/user/TheKneeSurgeon/videos	<ul style="list-style-type: none"> • Channel from one of the pioneer in knee research • Boasts of videos demonstrating tests, reading MRIs, recent developments in the field, and surgical techniques • An excellent channel for surgeons interested in knee arthroscopy 	5.61 k	Free
7	Orthopaedics & Trauma in YouTube	https://www.youtube.com/c/kgokkus0707/featured	<ul style="list-style-type: none"> • Contains videos about various diseases in orthopaedics, which are explained well in regard to causative factors, diagnosis, and surgical treatment 	5.4 k	Free
8	OrthoIllustrated	https://www.youtube.com/user/OrthoIllustrated/videos	<ul style="list-style-type: none"> • Arthex's you tube channel • An excellent source of information regarding newer methods and innovations in the field of arthroscopy and trauma 	17.7 k	Free
9	OrthoClips	https://www.youtube.com/c/OrthoClips/featured	<ul style="list-style-type: none"> • Educational resource for surgeons and residents with focus on 	21.9 k	Free
10	OrthoTV	https://www.youtube.com/c/orthoTV	<ul style="list-style-type: none"> • Channel contains multiple educational webinars and patient educational videos which can be useful to all 	13.2 k	Free
11	Dr. Vinay Kumar Singh	https://www.youtube.com/c/DrVinayKumarSingh	<ul style="list-style-type: none"> • It contains numerous surgical videos that surgeons and residents alike can use for training 	41 k	Free

Podcasts refer to episodic series of spoken word digital audio files that a user can download to their device for easy listening (Wikipedia). Most of the podcasts can be accessed by streaming apps such as iTunes or Spotify. Orthopaedic podcasts that are helpful in learning are very few. Mostly these podcasts are for patient education and are not directed towards the education of the budding physicians. Orthobullets podcasts seem to contain the maximum educational audio clippings among the lot and are more precise with the knowledge it imparts. It becomes an easy additional option for the residents [29] to access these online audio lecture clippings whenever required.

Although the present study highlights various online orthopaedic learning resources concisely, it has some limitations worth mentioning. Being a narrative review, it becomes less important than a systematic review which is much more superior according to evidence-based medicine. One should always strive for a systematic review but the immense number of websites and channels in YouTube make it an exhaustible task. The final selections were made by experienced surgeons on the basis of their assessment. There may be bias in not selecting a few other relevant online educational tools.

Conclusion

Online educational tools are of immense importance in imparting adequate knowledge to an orthopaedic resident and acts as an adjunct to conventional teaching methods. With the technological advancements and easy accessibility in modern times, they are gradually becoming more and more acceptable among the group of young residents and trainees. This article focuses on presenting various online educational resources in a simple yet concise way, which may be beneficial for the current generation of residents and trainees in orthopaedics.

Declarations

Ethics approval Approval from the institutional ethics committee was not required for this review article.

Informed consent Informed consent was not required for this review article.

Conflict of interest The authors declare no competing interests.

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