

# Advantages and Challenges of Virtual Outpatient Education: A Review Article

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**Abstract-** This study reviews articles published in the last two decades to determine the pros and cons of virtual outpatient education for undergraduate medical students and residents. A review of articles published between 2001 and 2021 in PubMed, Scopus, ERIC, and google scholar databases. Keywords for this search were: Ambulatory care/Outpatient clinics and education, and medical/internship and residency. The emphasis of this study was on the implementation of any kind of E-learning in outpatient clinics. Out of 5100 in the initial monitoring, 168 articles were reviewed based on the full text. Finally, information on 11 articles was extracted. Results were summarized in 4 areas: methods and tools used in e-learning, benefits of e-learning, challenges and limitations of e-learning, and student support. The main methods used were telemedicine via video conferencing and telephone calls, especially for residents. Other were virtual clinics with a simulated patient, as well as online educational modules. The main preponderances were: increasing knowledge and skills of telemedicine, improving medical knowledge and skills, access to educational resources even during patients visit, the possibility of learning at any time and place, and betterment of the quality of care. The main challenges were lack of technological literacy and lack of Internet access for some patients, time-consuming entry of patient information for students, reduction of clinical experiences, the unfeasibility of acquiring full skills in performing physical examinations, or some technical and procedural skills and hardware/software technological problems. Regarding student support, the main activity includes holding orientation sessions on new approaches for trainees. Due to the urgency of using virtual outpatient education in the corona era, it is predicted that in the post-corona era, we will see a tendency to use this method by stakeholders. Certainly, citing the results of original articles and reviewing them, similar to the present study, can make it possible to implement qualified E-learning innovation in clinics with quality in the future.

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**Keywords:** Ambulatory care; Outpatient clinics; Medical education; Internship and residency; E-learning; Virtual education

## Introduction

The importance of outpatient education for undergraduate and postgraduate medical students is distinct. With the increasing progress of medical science and changes in health structures, reducing the length of hospitalization and increasing the number of patients referred to ambulatory settings, the need to move from education in inpatient wards to clinics was already felt, and this has led to the emphasis of various medical organizations and committees around the world on increasing the share of outpatient education (1-3).

Normally, outpatient education is often done in person and face to face with the patient and under the supervision of preceptors (4). However, with the advent of the Corona pandemic, many problems arose in many areas of medical science, including medical education (4,5), while many institutions initially suspended clinical education to protect student safety but in Continue moving toward distance learning and virtual education (6-11).

E-learning, in general, means the use of information and communication technology in teaching and learning (8). Many educational institutions, due to flexibility,

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## e-Learning and outpatient education

removing barriers to time and space, being student-centered, and especially solving the problem of faculty shortages, have always considered this approach (8,12).

It's obvious that the perspective of medical education will change in the post-corona era, and e-learning will be of particular importance (5,13). Success in using e-learning depends on knowing when, how, and where it can be used; not paying attention to this issue can turn the usefulness of this approach into problems and challenges (8). The main challenge in virtual clinical education is the reproducibility of key features of clinical encounters, especially communication, interprofessional and clinical skills teaching (5).

In this article, e-learning refers to any use of information and communication technology (ICT) that the facilitated teaching-learning process. Although the use of e-learning in medical education has a long history, there is limited evidence of its use in outpatient education. Therefore, considering the importance of e-learning in the post-corona era, we decided to review the studies that have dealt with virtual teaching in clinics in the last two decades while listing the methods used and assessing the advantages and challenges of using education. Student support approaches will also be addressed due to the importance of the issue.

## Materials and Methods

In this study, the PRISMA protocol has been followed. In July 2021, the initial search was performed on databases such as PubMed, Scopus, Embase and ERIC, and Google Scholar based on a specific search strategy determined with the help of a librarian. Due to the wide range of terms used for e-learning and in order not to miss related articles, it was decided to search articles related to outpatient clinic education initially; Thereinafter, in the screening phase, articles that mention the use of any information and communication technology in-clinic education be selected. Keywords included: "Ambulatory Care Facilities," "Ambulatory Care," "Monitoring, Ambulatory," "Outpatient Clinics, Hospital," and "Education, Medical," "Education, Medical, Undergraduate," "Education, Medical, Graduate, "Internship and Residency. "

Some related phrases and synonyms were also used in the search strategy using word clusters and proper Boolean operators (AND; OR).

In the screening phase, related, in undergraduate medical students and residents, in specialized outpatient clinics that included original quantitative, qualitative, and

mixed-method research papers and were published in the present century (January 1, 2001, to 21 September 2021) entered the study. Since the purpose of this study was only outpatient clinics, other settings related to ambulatory care, including emergency rooms, primary care (health) clinics, and student-free clinics were excluded. Also, articles that dealt with pre-clinical years and editorials/commentaries/letters/education and review articles were not included.

Results from various databases were entered into EndNote X9 software (Clarivate Analytics, USA) and duplicates were removed. Then, two researchers (B, M, and B, A) separately screened studies based on the titles and abstracts. Articles that did not have an abstract or the abstract of the article were not clear according to the inclusion criteria, their full text was reviewed. Any disagreement between the two scholars was resolved by reaching a consensus. After initial screening, the full text of all related articles was independently reviewed by two researchers for eligibility. In this process, any disagreement between the authors was resolved through group discussion or consensus with the third member (A, M). Excel software was used to collect information. The data collected for each article included the authors, the location of the project, the purpose of the study, the target group, the results, and so on.

## Results

Database searches yielded 5100 articles (Figure 1). This was narrowed down to 3839 after the removal of duplicates. Screening abstracts of 3207 articles was excluded due to unrelated settings, fellowship education, etc. Of these, 11 satisfied the review Criteria (Figure 1). Of the 11 articles, one was in Germany, one was in Australia, and the rest was in the United States. 6 articles were related to undergraduate students and 5 articles were related to residents' clinic education. Demographic information of 11 articles is given in Table 1.

Of the 11 articles, two were in German and Australia while the rest was in the United States. 6 articles were related to undergraduates and 5 articles were related to residency. Demographic information of 11 articles is given in Table 1.

The results were summarized in 4 areas: methods and tools used, benefits, challenges, limitations, and student support in e-learning.

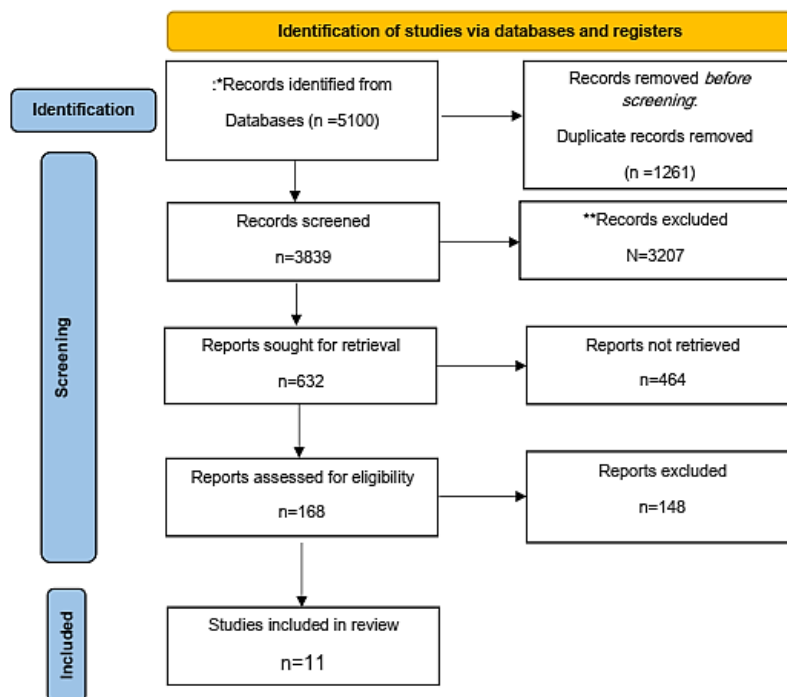


Figure 1. PRISMA diagram

Table 1. Demographic information of selected articles

No	Study: First Author, Year, and Country	Aim of study	Participants/Study Design	Field of clerkship/ internship	Method
1	Weber et al. (6), 2021, USA	To provide students with opportunities to utilize telemedicine technologies for authentic patient encounters and enable them to understand telehealth applications and factors affecting the ability of patients to connect remotely	64 Fourth-year medical students/ design an elective course	-	Telemedicine visits via electronic medical records, phone call and video call using HIPAA Doximity and Doxy.me applications; a cloud-based video conferencing platform with a virtual waiting room
2	Rydel et al. (7), 2021, USA	To describe a pilot program of a direct patient care, virtual health curriculum and detail the successes, barriers, and lessons learned in the rapid implementation of this educational innovation	5 students in 2nd clinical year/ curriculum development	family medicine	Telemedicine visits via institutional Epic electronic health record (EHR) software, phone call and video call: a commercial non-HIPAA free teleconferencing technology telemedicine visits via video call using platforms BlueJeans and Doximity/ video-conference on a laptop or tablet placed in the examination room (for the limited number of in-person outpatient visits)
3	Chao et al. (10), 2021, USA	To develop elective telemedicine-based ambulatory to allow medical students to build skills in clinical interviewing, presentations, and outpatient management	just said medical students/ curriculum development	elective Otolaryngology - Head and Neck Surgery	
4	Chiu et al. (9), 2021, USA	To focus on the trainee response to telemedicine and how confident they were with their medical practice through this new technique	95 internal medicine residents/?	Endocrinology/ Geriatric/ Nephrology/ Neurology/ Gastroenterology/Cardiology and General Medicine	telemedicine visits just via telephone calls

Cont. table 1

5	<b>Afshari et al. (14), 2019, USA</b>	To evaluate a novel, formalized experiential outpatient teleneurology curriculum's effect on resident knowledge about telemedicine, perspectives on teleneurology video visits, their perspectives on the challenges and benefits of teleneurology practice, and their self-assessed competence in teleneurology practice	11 neurology residents (PGY3 and PGY4 years)/ curriculum development	neurology	Telemedicine visits via live video-conferencing using Cisco Jabber software and e-consultations using a shared electronic medical record
6	<b>Succar et al. (15), 2013, Australia</b>	To determine the impact of VOC (Virtual Ophthalmology Clinic) on student's learning in ophthalmology within the medical program in comparison with traditional modes of ophthalmology teaching	188 third-year medical students/ a randomized control trial	ophthalmology	Computer-assisted learning (CAL) program: A Virtual simulated Ophthalmology Clinic (VOC) for doctor-patient relationships in a virtual consulting room with virtual simulated patients (and a conversation navigator as a tool to enable history and examination assessment)
7	<b>Wünschel et al. (16), 2010, Germany</b>	To describe the usage of a web-based virtual orthopedic outpatient clinic and evaluate the students' experience to find out how and when the students used the system and what effect it had on their learning success	160 fifth-year medical students/ design a mandatory course	orthopedic (a mandatory part of the practical Curriculum)	Blended learning: a practical face to face training and a web-based virtual orthopedic outpatient clinic with virtual simulated patients created using the "Inmedea- Simulator that server is programmed in Java Telemedicine visits via Polycom ViewStation 512 MP with Dual 46-inch flat screen plasma monitors; The system is capable of making calls using the ISDN network up to 512 Kbps or using the hospitals IP network up to 2 Mbps
8	<b>Szefel et al (17), 2008, USA</b>	To assess the impact of a telepsychiatry rotation on the self-assessed clinical skills and knowledge of psychiatric residents and fellows using a side-by-side supervision model	13 psychiatry residents (13 3rd year and 2 2nd year) and 8 fellows	psychiatry	On line web-based module through the Johns Hopkins ambulatory learning Internet-based Learning Curriculum website with web links to references and other resources
9	<b>Dy et al. (18), 2008, USA</b>	To develop, implement, and evaluate an online hypertext module for internal medicine house staff based on evidence for outpatient palliative care pain management	600 internal medicine residents/ Module Development	mandatory internal medicine	Internet-based Curriculum to accommodate a pretest didactics-posttest curricular format
10	<b>Sisson et al (19), 2004, USA</b>	To find out if a curriculum in ambulatory care delivered via the Internet could be incorporated into a range of residency training programs and program directors would rate features afforded by the Internet favorably and would view this Curriculum as a valuable educational resource	1,749 internal medicine residents and 24 residency programs/ curriculum development	internal medicine	Electronic educational support via a Handspring Visor Deluxe PDA with 8 MB of RAM and Palm OS operating system
11	<b>Speedie et al (20), 2001, USA</b>	To support students enrolled in a family practice clerkship in their learning experiences using personal digital assistant (PDA) technology	125 medical students/ educational support	family practice	

### Methods and tools used in virtual clinic training

More than half of the articles (6 articles) used telemedicine visits by phone and/ or video teleconferencing for virtual outpatient education (6,7,9,10,14,17). Two papers presented the virtual clinic using a virtual simulated patient, one offline (15) and the other web-based (16). Two related to online and web-based curriculum presentations (18,19), and one employed PDAs as learning (20). In each of these articles, different platforms and programs were used, the details of which are given in Table 1.

The reasons for choosing platforms or software and their limitations were examined in two studies:

Reydel cited the use of a non-HIPAA business

teleconference technology for being free, easy to use, and familiar to most users (7). Wünschel used "in media-simulator" because it only needs a browser that supports JavaScript and does not require any program or applet other than a flash plug-in, while very complex cases can be done without specialized computer knowledge (16). Graphic design of the user interface by an artist, the ability to navigate within the virtual clinic with just one click, and virtual support are other privileges of this website. Besides, this simulator provides the student access to multimedia documents in the library module and to participate in the patient discussion forum. This simulator records all student actions, including biographies taken, physical examinations performed,

diagnoses and plans suggested while calculating the correct diagnoses, examinations that have not been performed or examinations that have been harmful, the time taken to reach the correct diagnosis or treatment and the cost-effectiveness, ranks the student's performance (16).

### **Advantages of virtual outpatient education**

In total, various benefits of virtual clinic education were stated in various articles, which can be classified into three groups:

Impact on increasing the knowledge and skills of telemedicine:

Improving telemedicine knowledge, providing opportunities to face telemedicine, gaining experience in telemedicine technologies, and the ability to use telemedicine in future patient care were among the items mentioned in the articles (6,7,10). Based on trainee views, the existence of formal education on telemedicine is useful and even necessary (10). In addition, such experiences will raise awareness of the barriers to using telemedicine services and how to use them in medical education (6). Feeling comfortable, gaining confidence and motivation to conduct a video or telephone visit, and the ability to communicate with patients remotely and understand their prospects are other benefits of using telemedicine in educating medical students and residents (6,10).

Impact on improving learning and enhancements learner satisfaction:

In most articles, general satisfaction with the course was explicitly or implicitly cited. Including the positive quality of education through telemedicine (7), overall satisfaction with and the effectiveness of the virtual clinic compared to traditional and old methods (15), the goodness of the virtual clinic (16), the suitability of online modules as a tool to improve outpatient education (19).

Improving learners' medical knowledge and skills was one of the main benefits stated in the articles (19-15). In some articles, attitudes were also mentioned, such as having fun and enthusiasm for a virtual clinic (15), deriving pleasure from learning with a virtual patient (16), more confidence in treating patients (17), and affecting the overall view on how to care a patient (18). Likewise, in two studies, the positive impress of virtual courses on future job choices was mentioned (9,16). The betterment of intervention on learning was described in more detail in some articles; In the study by Rydel *et al.*,

although the students were more observant, this was a good opportunity to learn by observing an experienced attending physician how simultaneous attention to patient interview and electronic health record (EHR) software while made decisions to manage the patient in a time-limited video visit (7). The other preponderance was accessibility to virtual cases and online educational materials as compensatory to achieve most of the goals in their logbook (7). Besides, students' increments in writing progress notes represent a high level of clinical reasoning and synthesis according to the preceptors' perspective (7). More sustainable learning and applicability of acquisition skills in history taking and physical examination through virtual clinics in the real environment, as well as the utility of virtual outpatient clinics in the diagnosis and management of eye diseases, were considered in the study by Succar *et al.*, (15).

Feedback, supervision, and interaction with faculty have always been considered consequential in clinical education. The preceptor's active participation in education (7), more direct contact between the student and the faculty than in traditional teaching in which students dealt more with residents (10), the effectiveness of the feedback and answers provided through the application for Learning (15), Providing the possibility of faculty supervision, giving feedback and corrective comments, furthermore critique of the overall students' performance at any time of virtual encounter, which is only possible in teleconferencing (17) and providing feedback to learners through Pop-up message screens in online curricula (19) are among the related benefits.

In terms of course management in the online Curriculum, the following preponderance can be enumerated; the ability to evaluate the amount of use of the program for each trainee, to screen the scores of different groups from different universities, to compare the scores of each module with other modules, to follow the scores for each learning objectives, the possibility of viewing Group score and comparison with the scores of all participants as well as the list of modules completed by each trainee for program directors (19).

Flexibility in accessing educational materials in terms of time and place (16,18), increasing the number of clinical encounters (6,20), impressing attending physicians' attitudes toward the student applying for residency due to more one-on-one interaction with her/his (10), access to online learning resources (19,20) were other issues raised.

### **Ameliorating the quality of care**

## **e-Learning and outpatient education**

Using telemedicine has fruits not only for educational purposes but also for the patient and the health care system. Based on the trainees' standpoint, providing services to a wide range of patients (6) decreases travel time for patients, reduces the stress and hassle of clinic visits for patients and service providers, reduces costs for patients and the health system, improves access to care for rural and remote patients, patients with disabilities, improving access to specialized services (10) while maintaining the quality of care (7) are other vantages.

### **Challenges and obstacles of virtual clinic education**

Some of the turbulences and barriers in providing virtual clinic education, especially in the use of telemedicine, were related to patients. Social determinants of health in low-income patients, lack of sufficient technological literacy, especially in older patients, patient's apathy in video visits, and patients' discomfort in discussing their medical conditions over the phone were among the most considerable (6,9,14). Requesting to change the date and time of the visit by patients, not answering the phone, the unavailability of the phone number, and disconnecting the phone due to the unwillingness to talk to the trainee also made the teaching and learning process Encountered a problem (6).

Many challenges posed in the articles were related to comparing virtual education with face-to-face training in the clinic. Learners, especially in telemedicine visits, mentioned their less interaction with the patient as a problem due to the impossibility of pre-visits or independent, taking the history that they could do in traditional clinics. When the teacher interacted with the patient, due to the impossibility of seeing the student at the same time, the transparency between the patient and the student was morally questioned (7).

Reduction of clinical experiences, the unfeasibility of acquiring full skills in performing physical examinations or some technical and procedural skills, and the difficulty of performing medication reconciliation or establishing a personal connection with the patient were noticeable subjects (9,10,14). While learner assessment in non-cognitive domains and personality traits was a limitation (10), trainee and preceptor apathy in telemedicine, lack of comprehensive faculty and trainee development program in telemedicine, equipment costs, and technical support could be challengeable (14).

Another category of obstacles and problems was technology-related issues; a wide range from patient-related cases, for instance: "not having access to the necessary equipment such as a smartphone or computer for patients, the difficulty in how to use the platforms, precedence to use simpler ways such as phone calls instead of platforms like "Doxy. me" to matters related to Systems used such as audio and video problems, the need for high bandwidth access, system crashes, and data loss and hardware problems such as system breakdowns were cited (6,7,16,19,20). One study also mentioned the need to pay to participate in the program (19).

### **Student support**

Most of what might be called student support or e-learning facilitators included orientation sessions. Executing an instruction session through Zoom video conference, recording meetings for the students' reusing, sending emails to students to identify the next week's preceptors and visits (6), holding a briefing session on communication skills and logging in (7), introducing residents to the technology used, aspects of telemedicine-specific history taking and physical examinations, and engage in multidisciplinary video calling by observing the attending physician in a few initial video calls, delivering a 60-minute interactive lecture on the evolution, Common methods, challenges and future tools of telemedicine (14), justification for Inmedea-simulator on the first day (16), Modeling the patient visits initially by the preceptors and providing guidance and supervision of the resident's performance in subsequent encounters (17) are some parables.

### **Discussion**

Almost half of the articles published during the Corona era (Figure 2) suggest the use of existing technologies and the replacement of face-to-face approaches with distance learning as a practical solution to the crisis (5). perchance this pandemic can be considered a milestone and a stimulus for a change in medical education (13). While E-learning will be an indispensable part of education in the post-corona era, futuristic plans to adapt to this situation are vital. In this article, we tried to provide an overview of the possible benefits and problems of virtual clinic education.

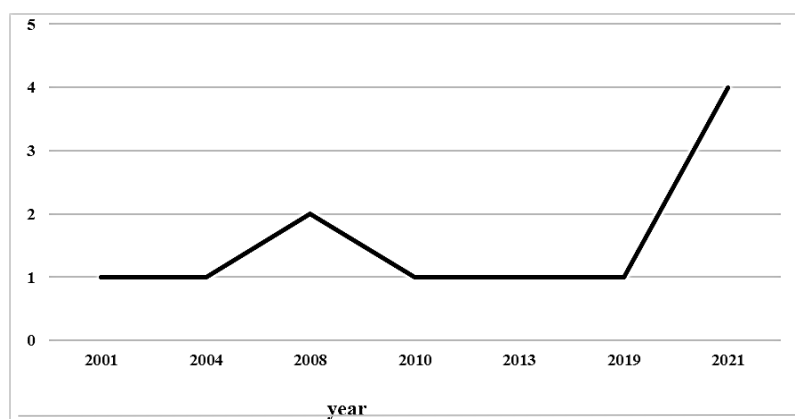


Figure 2. The trend of the number of articles in the field of virtual outpatient education from 2001\_2021

Despite exploiting different platforms and applications in the articles, while only two studies addressed the reasons for their choice (7,16), other studies did not provide information in this area. In addition, in these two studies, software limitations were not specified. The efficiency of platforms is another issue that was either not evaluated at all in the studies or was limited to one question in program evaluation, including the ease of use of the simulator, the pleasant, artistic design, and the realistic and interactive environment in the study of Wünschel *et al.*, (16).

Improving knowledge and skills was mentioned as one of the privileges of e-learning, but it should be noted that only one article examined this issue in a clinical trial study with the control group, just according to a pre and post-knowledge-based test (15). The influence on learners' skills was furthermore studied in one article using the OSCE test with an online case (7) and in one study based on clinical self-assessment (14). Three studies merely assessed the satisfaction and views of learners (6,9,20).

What was referred to as patient-related problems were all based on trainees' perspectives, and none of the studies examined the patients' opinions or the impact of interventions on care. Only one study cited the effectiveness of the program on patient care again from the learners' conception (18), while in clinical education, the patient is always an integral and effective part of teaching and care.

Using new approaches, one issue that affects its acceptability is the justification and empowerment of learners and faculty. This was discussed in detail as Student Support in the results section, but regarding faculty development, only one study addressed this issue, which included a mandatory 45-minute webinar about telemedicine (7).

The clinical education triangle always includes the learner, the patient, and the instructor. Though there was a gap in surveying the opinions of faculty and program directors in studies, one article implicitly mentioned that program managers also considered the online Curriculum to be effective in their knowledge and disease management (19).

The last point is that one of the key and momentous factors in the use of technology is cost-effectiveness, except for the study noticed that required a monthly payment of \$ 1,500 to participate in the program (19). None of the studies addressed this issue.

With the development of science and technology in medical science education, ambulatory teaching has also joined the jirga of events suitable for virtual learning. Since all medical education events ultimately relate to the life, death, or recovery of patients, it seems that virtual innovations in delivering or inventing new methods should be done with more caution. Today, different universities around the world have a variety of experiences in virtual outpatient teaching and learning that can provide good information to qualified E-learning in clinics for those interested.

Although the number of published experiences in this field is small and sometimes incomprehensive, this review study explained some of the benefits and challenges of virtual outpatient education, which is a valuable set for the institution and organizers of this approach. On the other hand, it seems that the shortcomings of some of the articles reviewed in this study are more due to the infancy of using this educational method in clinical education than to the quality of the article, so it is predicted providing more appropriate guides in the future through the rapid increase in the number of similar articles in universities.

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