Review Article

Employing E-learning Tools and Resource Materials in the Successful Implementation of Competency-based Medical Education in India

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Abstract

Competency-based medical education (CBME) has emerged as one of the modes of the curriculum which is built around a framework of competencies and plays an important role in the making of a healthcare professional who is competent enough to meet the health care needs of the society. The purpose of the current review was to explore the role of e-learning in enhancing learning in different domains of learning and identify the various e-learning resources. An extensive search of all materials related to the topic was carried out on the PubMed search engine and a total of 35 articles were selected based upon the suitability with the current review objectives and analyzed. The search was carried out for a period of one month and all articles published between 2003 to 2021 were included. As only one search engine was used, there were no duplications. Keywords used in the search include e-learning and medical education in the title alone only. E-learning has been acknowledged as one of the significant curricular reforms, which has the potential to bring about a paradigm shift in medical education in India. The basic rationale for the utility of e-learning in the medical curriculum originates from the fact that the syllabus is extremely vast and students have to study many subjects in a fully-packed schedule, and that cannot happen only within the classroom hours. E-learning can play an important role in the augmentation of cognitive, psychomotor, and attitudinal/communication skills through the optimal use of e-learning resources. To conclude, e-learning has emerged as an important approach to strengthen the process of implementation of competency-based medical education in Indian settings. The need of the hour is to acknowledge the merits of e-learning and plan strategies for the successful integration so that the overall process of CBME implementation can be strengthened and streamlined.

Keywords: Competency-based medical education, e-learning, learning domains

Introduction

Competency-based medical education (CBME) has emerged as one of the types of the curriculum which is built around a framework of competencies and plays an important role in the making of a healthcare professional who is competent enough to meet the health care needs of the society.[1,2] In India, we transitioned from the traditional curriculum to a competency-based curriculum for undergraduate medical students from the year 2019, and the much-awaited revision in curriculum actually got materialized after more than two decades.[1,2] It was a historical move, but the process of planning and implementation has been significantly impacted by the emergence of the COVID-19 pandemic, which has forced the stakeholders to either resort to e-learning alone or a

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blended form of curriculum delivery.[1,3] The purpose of the current review was to explore the role of e-learning in enhancing learning in different domains of learning and identify the various e-learning resources.[4-6]

Materials and Methods

An extensive search of all materials related to the topic was carried out on the PubMed search engine. Relevant research articles focusing on e-learning in medical education and learning domains published in the period 2003 to 2021 were included in the review. The search was carried out for a period of one month and as only one search engine was used, there were no duplications. A total of 41 research papers (viz. Randomized Controlled Trials, Original articles, Qualitative research articles, Mixed-Methods studies, Case reports, Medical education, etc.) similar to current study objectives was identified initially, of which, six were excluded due to the unavailability of the complete version of the articles. Overall, 35 articles as mentioned in [Table 1] were selected based upon the suitability with the current review objectives and analyzed. Keywords used in the search include e-learning and medical education in the title alone only (viz. competency-based medical education [ti] AND India [ti]; online teaching [ti] AND medical education [ti]; e-learning [ti]; e-learning [ti] AND knowledge [ti]; e-learning [ti] AND skills [ti]; e-learning [ti] AND communication [ti]; e-learning [ti] AND attitude [ti]; online learning resources [ti]). The articles published only in the English language were included in the present review [Figure 1]. The collected information is presented under the following sub-headings, namely E-learning in CBME, E-learning and Cognitive domain, E-learning and Psychomotor domain, E-learning and Affective/Communication domain, Utility of e-learning in implementation of CBME, E-learning resources, E-learning resources in India, and Lessons from the field.

E-learning in CBME

E-learning has been acknowledged as one of the significant curricular reforms, which has the potential to bring about a paradigm shift in medical education in India.[3] One of the core competencies expected of an Indian Medical

Table 1: Distribution of Type of articles

Type of Articles	Country of Origin
Original Articles	China,[3] Italy,[7] Iran,[8] Singapore,[9] Germany,[11] Ireland,[12,16] Australia,[13,15,34,35] Korea,[14] United States of America,[17] Canada,[18] Indonesia,[24] India,[30] Kingdom of Saudi Arabia,[31]
Randomized Controlled Trials	Netherlands,[5,19,23] Spain,[10,22] Turkey,[27]
Qualitative Research Article	Finland,[6] United Kingdom,[20]
Mixed-Methods studies	Japan,[21] United Kingdom,[26]
Others (Comments, Case reports, Medical education, etc.)	India,[1,2,4,33] United States of America,[25,28,29] Canada,[32]

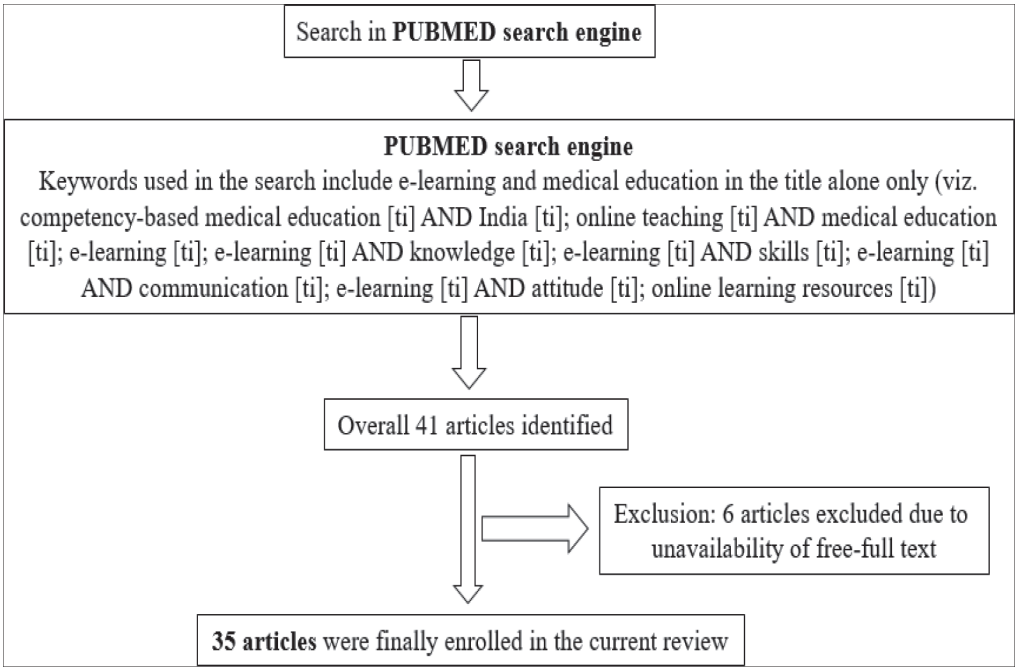

Figure 1: Flowchart for selection of research articles

Graduate is to be a lifelong learner and in order to attain this competency, we have to make students self-directed learner. A number of strategies have been tried to encourage students to become lifelong learners and one of them is the inclusion of the e-learning component in the curriculum delivery.[3,4] This is required because an Indian Medical Graduate is expected to exhibit the ability to search (including via electronic means), and thereby critically evaluate the available literature and use the collected information for patient care (evidence-based medicine).[4] The basic rationale for the utility of e-learning in the medical curriculum originates from the fact that the syllabus is extremely vast and students have to study many subjects in a fully-packed schedule, and that cannot happen only within the classroom hours.[2-4] In addition, as all medical students are adult learners, they learn at their pace and at their time of convenience, which need not be within the walls of classrooms, and thus once again, the need for e-learning in the medical curriculum is reinforced.[3,4]

E-learning and Cognitive Domain

E-learning in competency-based medical education can be employed for enhancing all the learning domains amongst medical students.[5-9] For instance, in the cognitive domain, online learning resources can be shared in the form of reading material or pre-class assignments, or even as audio / video clips. There is always an option for the teachers to conduct flipped classrooms, wherein students are informed about the upcoming class and the resource material is shared with them in online/offline mode, and students come well prepared for the sessions.[5-13] The option of breakout rooms can be utilized to plan and conduct small group teaching sessions and enhance interaction amongst students, while Zoom or Google Classrooms or Microsoft Teams, etc., can be utilized for large group teaching.[6-11] These e-learning applications encourage both synchronous (for instance, via Zoom or BigBlue Button, etc.) and asynchronous (such as through learning management system) forms of learning.

E-learning and Psychomotor Domain

In the case of the psychomotor domain, online tools can be used to help the students in the "knows-how" level of learning. The students can be demonstrated various diagnostic or procedural or interventions in the audio-visual mode, and subsequently. students can read about the same or start practicing the same if required.[14-16] Moreover, through the options of virtual patients or simulation technology, medical students can be taught various skills (such as clinical reasoning, diagnostic skills, airway management, cardiac lie support, suturing, endoscopy, etc.).[17-19] This simulation technology provides medical students with multiple learning opportunities till they master the skills, which in turn play a crucial role in minimizing medical errors, and thus enhance patients' safety.[15-20] In addition, e-learning based courses can also aid in improving prescription writing skills or fundus examination skills of the medical students.[20-22]

E-learning and Affective/Communication Domain

In the case of the affective and communication domain, videos or recordings of good and bad doctor-patient interactions can be shown to the students to enhance learning.[23,24] Moreover, the use of different online learning methods (such as online case studies, virtual patients, e-journals, e-books, etc.) also plays an important role in benefitting different learning domains. If students are not aware or reluctant to speak in a particular situation (say, breaking bad news to relatives), they can be asked to post their responses in discussion groups on a blog or a wiki page.[24-26] Even though it is an asynchronous form of learning, students can learn important attitude and communication skills. On a similar note, even synchronous communication can be accomplished by web conferences or chat rooms.[25-28]

Utility of E-learning in Implementation of CBME

The one-month-long Foundation Course advocated as a part of the competency-based undergraduate curriculum envisages the learner to acquire e-learning skills, and this has been accomplished by training the medical students in different computer-related skills.[3,4] The new regulatory norms have also backed the mandatory establishment of skill laboratories in each and every medical institution, and this provision can be definitely utilized for e-learning.[4,29,30] Apart from using e-learning technology for the teaching-learning purpose, it can also be employed for carrying out the assessment and ascertaining the extent to which students have learned.[31,32] This can be carried out by multiple choice questions, extended matching questions, diagnostic reasoning problems, virtual objective structured practical/clinical examinations, viva-voce, etc.[31,32]

E-learning Resources

Any resource available on the internet can be acknowledged as an e-learning resource and they can be systematically used to facilitate the successful implementation of competency-based medical education. This can vary from simple Hypertext Markup Language documents (like lecture notes, assignments, answers to questions, learning objectives, etc.), audio or video lessons, interactive assignments, assessments, etc.[33,34] The e-learning resources include mobile-based learning through various applications that can bring the course content to students at their fingertips. Further, there are a number of courses run by Coursera, edX, Lynda, etc., which can be utilized by the students for deriving maximum benefit.[34,35] Microlearning is another e-learning resource

that combines audio, visual, and kinesthetic components to ensure integrated learning. Further, resources like interactive videos, augmented reality applications (that enable students to experience different things in a virtual environment) are also of immense benefit.[33-35]

E-learning Resources in India

In India, e-learning resources have been provided to different stakeholders, including medical students and faculty members via SWAYAM Online Courses (mandatory for postgraduates and faculty members to pursue Basics in Biomedical Research),[36] e-PG Pathshala (which provides good quality interactive content in the form of modules in many disciplines),[37] e-content courseware for undergraduate subjects, SWAYAMPRABHA (delivery of educational curriculum through direct to home channels),[38] National Digital Library, Shodhganga (compilation of Ph.D. thesis in electronic forms that is open access), e-Shodh Sindhu (enables access to peer-reviewed journals, bibliographies, and citations in different disciplines), etc.[36] Further, the options of Google docs, Zoom, YouTube, Microsoft teams, Whatsapp, Facebook, Wikipedia, etc., can be employed for the sake of learning. However, the actual benefit of these available learning resources can be derived only when the administrators' support the process and faculty members are ready to be a part of the entire process and willingly decide to pass on to the medical students.[33-35]

Limitations of E-learning

We acknowledge that e-learning has multiple merits and will prove to be a useful tool in the successful implementation of CBME, but it has its own limitations.[1,2] Primarily, in the initial stages, it requires financial investment for establishing the set-up, technical equipment, trained technician, software, hardware, other logistics, etc., and thus it is very important to have the support of management or administrators.[1-3] The next concern is the reluctance of faculty members or lack of confidence to adopt e-learning tools, especially by the senior faculty members, who find adaptation to e-learning as extremely challenging.[3,11] On a similar note, poor sensitization of students about e-learning and its merit can also turn out to be a significant barrier.[12]

Further, owing to the constraints that are there with regard to teaching and assessment of psychomotor and affective domain, the use of e-learning in medical education has not reached desired levels.[20-26] Moreover, questions have also been raised about monitoring the academic honesty of the students during assessments. Majority of the identified challenges can be managed by proper sensitization of the teachers and students, and support from the administration.[2,4,11,19] Subsequently, individual specialties can have their department-level meetings to formulate their plans to benefit the students and be as creative as possible.

Lessons from the Field

Once it was identified that the COVID-19 infection spreads by close contacts, as a precautionary measure, almost all medical colleges shifted to e-learning from the traditional face-to-face learning.[3] In China alone, in excess of 200 medical students were taught using variety of e-learning tools and applications.[3] At Shri Sathya Sai Medical College and Research Institute, a constituent unit of the Sri Balaji Vidyapeeth, Deemed-to-be-University, Puducherry, a number of initiatives have been taken to incorporate e-learning in the process of implementation of CBME. The Medical Education Unit of the institution has been involved in training of all the faculty members about various synchronous and asynchronous modes of e-learning. Further, all faculty members have been trained in developing e-content by sensitizing them about developing modules in the learning management system. In addition, the Medical Education Unit has also organized a national workshop-cum-webinar on the use of online tools in teaching-learning and in assessment. As a result of these initiatives, faculty members from different departments have come forward and used a wide range of tools for the benefit of medical students in all the learning domains.

Conclusion

In conclusion, e-learning has emerged as an important approach to strengthen the process of implementation of competency-based medical education in Indian settings. E-learning can play an important role in the augmentation of cognitive, psychomotor, and attitudinal/communication skills through the optimal use of e-learning resources. The need of the hour is to acknowledge the merits of e-learning and plan strategies for the successful integration so that the overall process of CBME implementation can be strengthened and streamlined.

Ethical approval

Not applicable.

Contribution details

SRS contributed in the conception or design of the work, drafting of the work, approval of the final version of the manuscript, and agreed for all aspects of the work

PSS contributed in the literature review, revision of the manuscript for important intellectual content, approval of the final version of the manuscript, and agreed for all aspects of the work

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Conflicts of interest

There are no conflicts of interest.

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