



Impact of Integrating ICT in Teaching and Learning Surgery for Students and CRRIS: An Institutional Study

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Abstract

Background: In present-day Competency-based medical education, Information and communication tools play a very significant role. Integrating ICT has opened up new avenues in synchronous and asynchronous teaching-learning both on and off the campus. With easy affordability and availability of the latest communication devices, hi-speed internet, and free campus Wi-Fi, it is believed that ICT in medical education helps the medical students, who are digital natives and teachers in pedagogical teaching, learning assessment, and feedback.

Methods: This cross-sectional questionnaire-based study, included 100 students in their final year and CRRIS' in the department of General Surgery, at Karpaga Vinayaga Institute of Medical Sciences and Research Centre for 6 months from December 2020 to June 2021. The data were analysed using SPSS version for both descriptive and inferential statistics

Aim: To assess the impact of integrating ICT as a teaching-learning tool, in knowledge and skills development and to assess the students' attitude and perceptions of ICT application in teaching-learning and skills development in Surgery. A total of 200 participants were provided with a prevalidated printed questionnaire.

Results: The medical students' knowledge, applications, familiarity with different search engines, and confidence in using digital resources are found to be very encouraging and comparable to the students of developed countries.

Conclusion: Technology-enabled learning using ICT will definitely make teaching-learning more interactive, student-centric, flexible, and engaging. Faculty development programs for teachers help in the effective implementation of ICT.

Keywords: Information and communication technology, CBME, Teaching and learning process, Faculty development programs Surgery.

Introduction

Digital learning, both synchronized and asynchronized have been in practice established already in western countries. Developing countries have also brought suitable changes to incorporate ICT in competency-based medical education.¹ Some domains like psychomotor skills in surgery can make effective use of ICT in teaching and training their students, though we may have to overcome some challenges.² Present-day medical education has shifted from traditional classroom lectures to learner-centric (pedagogical), competency-based, where assessment plays a key role, not only T-L but also competency-based assessment³. Integration of ICT in surgery, with traditional classroom teaching, is more relevant in bringing out a competent medical graduate. This is due to the impact of ICT in providing dynamic, interactive, student-friendly teaching-learning environment. According to Albirini adoption of ICT is a continuous process that emphasis faculty development programs for the teachers to adapt to

ICT as they are digital migrants. On the other hand, since the present generation of medical students are digital natives, they quickly accept ICT and are comfortable with digital tools integration of ICT⁴. This contributes quite a lot to the pedagogical aspects in which the application of ICT will lead to interactive learning of knowledge and skills which is very essential in a subject like surgery. Surgery teaching and skills development has transformed recently with the incorporation of ICT tools like simulation, and videos, and transformed the way of teaching and assessment.⁵ Though developed countries have started using at least two decades ago, with the new curriculum developed by NMC of India, we also started catching up and transformed the way of T-L and assessment of surgical training. It must be stressed that in a developing country like India with resource constraints ICT can't replace traditional face-to-face teaching, but can be considered as an effective complementary tool in selected topics and skills.⁶ Our present study was undertaken to assess how these ICT tools have impacted teaching, learning, skills training, and assessment of Surgery. Integration of ICT in Surgical training presents lots of opportunities and challenges in undergraduate surgical education. It is important to assess the knowledge and application of ICT among surgery trainees in where the traditional model of education is practiced till recently. This may enable us to integrate e-learning into the traditional teaching towards learner-centric competency-based education in surgery.

Methodology

This cross-sectional self-administered questionnaire-based study was conducted for a duration of 6 months from December 2020 to June 2021 in our department of General Surgery, at Karpaga Vinayaga Institute of Medical sciences with a questionnaire that was prevail dated. The questionnaire and study have the approval of the Institutional Ethical committee. Self-administered Questionnaires were given to students (n=100) and CRRIS (n=100) total (n=200) and responses were collected within the stipulated time of one week. The data collected in excel was analysed with SPSS 21 version. (n=200)

Study design: It is a questionnaire-based cross-sectional study consisting of

1. Demographic profile of the students
2. Benefits of ICT in T-L
3. Skills-based ICT
4. Students' perception of ICT IN T-L in Surgery
5. Students' perception of ICT in the surgical skills development

Results and Observations

After the pilot study, briefing the data collection and purpose of the study, study participants were provided with a self-administered questionnaire and requested to send back responses within the mandatory 7 days. Responses to the questionnaires were received from 200 participants entered in excel and data analysed. Out of 100 students and 100 CRRIS' (Compulsory Rotatory Residential Internship)

participated ,108were female and the rest were male. 128 students were from urban backgrounds and the remaining participants were from suburban or rural areas. The girls outnumber the boys in participation may be the strength of girls in the 2017 batch is more than the boys. (Table 1) Naturally, all students had some basic education in computers in their school days and were aware of the use of digital devices. (n=200)

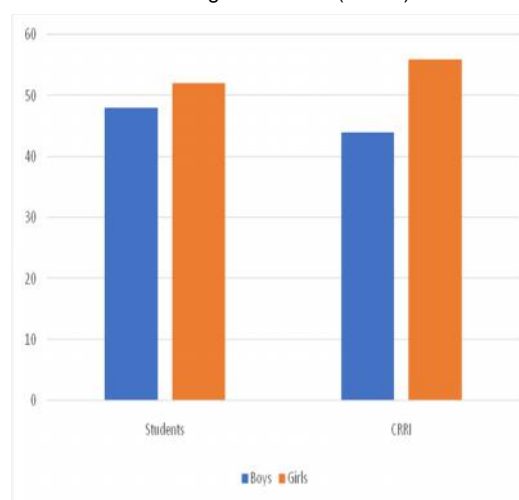


Table 1. Male and female participants: Students Vs CRRIS

Regarding the second variable on the number of hours spent by the participants, CRRIS and male participants found to be spending more time than students and female. Out of 200 participants, 42 students (42%) and 28% of CRRIS were found to be spending less than two hours in a day on ICT, 46 students (46%) and 66 CRRIS (66%) spending 2-4 hours, 4 CRRIS (6%) and 10 students (for 4-6 hours) and 2 CRRIS for more than 6 hours. (Table .II)

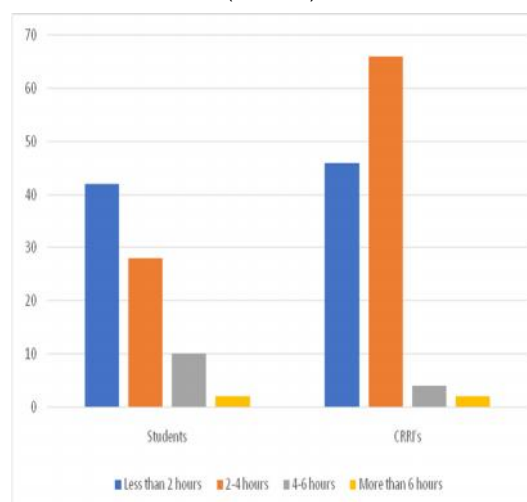


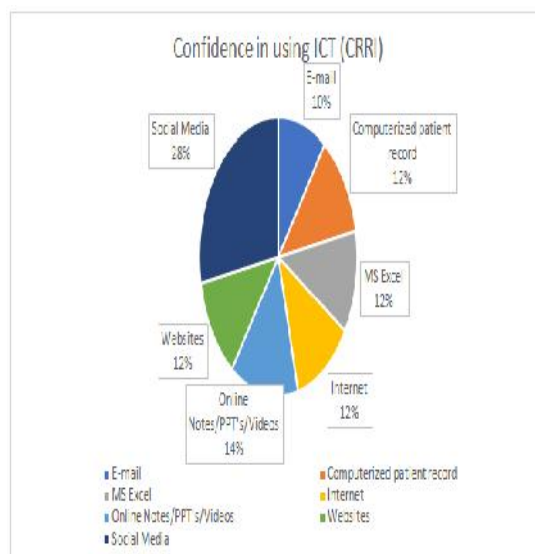
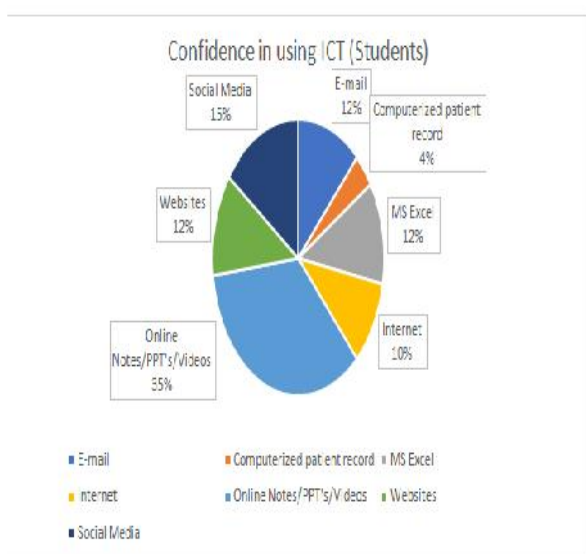
Table II. Average Time Spent: Students Vs CRRIS

Level of comfort level, confidence, availability of the network, and ease of using ICT tested on a scale of 1 to 5 (Likert chart). Though all were aware of the parts of a computer, digital devices like laptops, iPad, mobiles, network services, etc for online applications the way they use it for learning purposes showed variations. The average score of the responses was calculated by maximum for regular use of the internet, downloading study materials, with the minimum score of students and residents who use occasionally, when there was a compulsion to do so, like online assignments submission. (Table.III)

STUDENTS						RESIDENT				
S.No	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Textbook	36	14	10	36	4	25	20	10	30	15
Internet CD ROM/ Videos	52	18	5	19	6	75	5	3	10	7
On line Power point Presentations	60	12	8	10	10	70	10	5	10	5
Digital Library	53	17	5	15	10	62	18	5	10	5
College Library	42	18	5	20	15	25	15	8	22	30
Only Classroom Teaching	28	12	25	25	10	25	10	15	25	25

No of respondents who agree for the use of various modalities for learning Surgery (Table: III)

84 students (84%) and 95% of interns strongly agree that ICT can be effectively used in their learning and assessment process in surgery, whereas only 10 (10%) of students and 5% of interns disagree, 6 (%) of students and none of the residents strongly disagree on the use of ICT in surgery. (Table. IV)



Participants including residents felt textbooks cannot be dispensed with, though resources available online. A thorough reading of syllabus-based books is important to them in clearing the exams (90%). Though ICT they felt complementary like, PPT presentations, videos, and drawing on surgical anatomy helped them to understand the subject better. Student's responses showed that surgery TL can be more interesting if the teaching methods are integrated with ICT.

Though all medical students have some kind of digital devices still accessibility of hi-speed network connection is an issue, especially in suburban areas in a developing country like India. Distraction due to pop-ups, breaking news, important events online is all considered unwanted distractions found to another disadvantage. According to a survey conducted in 2011, 70.21% of the students were in agreement with the use of ICT in medical education while 23.40% of students disagree with this, whereas in our study 80% consider ICT more relevant in surgery education so the Integration of ICT in education will be part of routine TL methods

Discussion

Broadly the power of ICT can be applied in two ways both pedagogy and teacher-directed learning, and open educational resources, MOOC and SPOC like created awareness about this ICT among students and faculties.⁷ Undergraduate Students and residents in surgery, ICT like simulation, skills labs, standardized clinical demonstration through audio-visual all play an important role⁸. However, resource constraints, accessibility to network, and affordability is the limiting factors though learners found them more effective. (Cook 2007 et al)⁹. Blended learning in today's competency-based medical education assessment needs integration of ICT in curriculum and institutes providing a suitable learning environment. (Child's et al. 2005)¹⁰

ICT has been implemented and accepted by Medical Institutes and students with huge success and with excellent results in resource-rich developed countries at least two decades back, but lack of access to technology is often a limitation in implementation in developing countries.¹¹ Lack of Scope in Curriculum, non-availability of necessary infrastructure, student's and teachers' attitude to the acceptance are some of the challenges we have to overcome for successful implementation.¹² ICT positively directing us towards pedagogical teaching, from online classes, sharing study materials, online videos, and PPT, conducting tests, assignments, instant feedback on their competencies¹³. Though ICT may appear as an interesting alternative to the traditional teaching-learning method, it cannot replace traditional classroom teaching where direct interaction helps the teachers understand the students and vice versa.¹⁴ Though ICT improves the effectiveness of education, it can at best act as a complementary tool facilitating online education that is inclusive. In addition, in developing countries like India, it has certain limitations including economic issues, availability of the uniform network, and lack of faculties acceptance¹⁵. Appropriate topic, choice of ICT, target

students, learning objectives also crucial in the successful adoption of ICT in surgery training. ICT not only trains students in teaching and skills development, in addition, familiarity with these tools prepare them inpatient care also as medical records and discharge process are nowadays done electronically.¹⁶ The national medical commission also stresses the need for training medical students in this direction, towards self-directed learning and a blended teaching environment. Residents and interns in surgery especially need to achieve so many competencies, that have to assess further reinforced with feedback. ICT help in skills development in skills from basic suture skills to advanced laparoscopic skills using ICT, to gain confidence before actual patient encounters.¹⁷

Observing the skills of trainers by examining their videos both virtual and on real patients encounters help the faculties assess the skills and give instant feedback as well as peer review. Live telecast of complicated procedure by experts using ICT is a huge benefit for the beginners to observe what is happening in the operation theatres.¹⁸ The modern educational environment is different from what it was many decades before. The vast differences in student demography, their personal traits, Internet technologies, and the latest electronic devices have been enforced to change it. As a result, educational institutes are exploring newer models of instruction that can transfer and inculcate necessary knowledge, skills, and attitude to meet out these challenges and could produce competent surgeons to serve the modern society.

As NMC begin to think about changing the lecture-based traditional teaching-learning process as the preferred teaching method by integrating technology in teaching-learning, blended and flipped learning have emerged as approaches of education design.¹⁹ Though there are variety of instructional methods available in today's digital world in most of the cases in a resource constraint country like India we can design our T-L based on: i) Subject-specific objectives and the competencies we want to assess on our learners ii). design module of teaching content based on these objectives) the evaluation of learner's performance and feedback Formative suitable assessment methods. All the students in a group with similar goals cannot progress through the course at the same speed and time, hence we have to design our modules in such a way that it has scope for slow learners as surgical training involves not only knowledge but acquiring competency in surgical skills and ATECOM (Attitude, Ethics, and Communication) also equally important. Fast learners can be used for peer teaching, feedback using simulation and ICT can play an important role in this.²⁰

Individualized instruction was introduced in developed countries many years ago. Teaching and training modules can be individualized teaching strategies to accommodate the slow learners and bring them to attain the competencies before the summative assessment, challenges faced by institutions in implementing ICT-enabled teaching are resource constraints and availability of high-speed internet throughout the campus including the library. Riley JB, Austin JW, Holt DW have documented that Internet-based virtual classrooms and educational management software enhance students' didactic and clinical experiences. Though ICT is used mainly for knowledge and skills they have the advantage of improving trainees' communication, doctor-patient relations, e-log books, documentation of students' data, their progress assessment. Curriculum for residents in surgery that includes both didactic and clinical education, the application of Internet-based simulated environment, and training modules provide an advantage over traditional models. In spite of Students' perception of the learning efficiency of digital training using ICT, they don't feel that they can dispense with the traditional face-to-face teaching with the physical presence of their teacher. As the paradigm of teaching shifts toward students centric learning a blended approach, in which ICT can be integrated for specific, suitable topics will help in facilitated teaching and improve the quality of education.²¹ Ekenze SO, Ugwumba FO et al in their study on surgical training also documented that application of ICT help to enhance the quality and boost interest in surgery as a career.

Conclusion

ICT can be integrated gradually as a part of blended teaching-learning, in medical education and skill development especially in surgery along with traditional classroom lectures in a country like India. Though ICT is an interactive teaching-learning tool, lack of uniform availability of free networks, and resistance to faculty development programs from seasoned teachers on new technology are considered as major limitations. The residents especially felt simulation would help them to gain confidence in their surgical skills. More interaction with teachers, online assignments, instant feedback, simulation all make ICT an effective teaching-learning method. The gradual integration of ICT with classroom TL will help us to succeed in the transition to digital pedagogy in surgical training. The use of information and communication technology has brought many welcome changes in teaching-learning methods, maintaining logbook and e-assessment, and online education, particularly in developing countries. Integration of ICT requires strategic planning, effective resource sharing, faculty development programs, active periodic multidisciplinary assessment, and quality control.

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