

Clinical Informatics In Medical Education: A Joint Venture That Holds Promise!

Dr. Kavita Krishna*, Dr.V.A.Saoji**, Dr.Sita Rama Budaraju***, Dr.D.G.Bhosale*, Dr.S.Chandorkar****, Dr.R.Jagirdar*****, Dr. J Oswal*****, Dr.P Bansode*****.

*Professor of Medicine, **Dean & Prinicpal, Professor of Surgery, ***Physician executive, Cerner Health Care Pvt LTD, Bangalore, ****Professor of Surgery, *****Associate professor of Pediatrics, *****Assistant professor of Surgery, Departments of Medicine, Surgery and Pediatrics, Bharati Vidyapeeth University Medical College (BVUMC)& Hospital, Pune-411001, Maharashtra, India.

Abstract : Background and Objectives:Healthcare information technology(HCIT) has potential in patient care as well as medical education, but is yet underutilized. With shortage of good clinical material, e-learning helps in supplementing a lecture/demonstration by an online tutorial. This 'blended learning' helps in meeting deficiencies of the exclusively traditional methods. Besides, with time constraints, there is a need for collaborative, on-line/web-based learning with a flexibility that would enable the students to learn at leisure. Methods: Seven faculty and 18 post-graduate students(residents) were exposed to the concept of clinical informatics at the BVUMC digital library, various features of Cerner Corporation's academic education solution(AES), software from US-based company (from Bangalore). Faculty participants were trained in building clinical cases into the system, entering investigations, medications and allergy information. They were trained in usage of message centre -giving and answering assignments, accessing links to medical terminology and reference material. Students had a point-of-learning ability to access medical literature and interdisciplinary management of a clinical case. Cases were built up step by step, so students were encouraged to evaluate and opine on patient's status and further management. Throughout the course, the system tracked and stored student performance. Results: The software was found to be effective (significant changes in pre and post test scores). The mean scores out of 20, pre and post test were 12.389 and 14.333. Paired T test and Confidence intervals were used for statistical analysis. T-Value = -5.93 P-Value = < 0.0001, i.e there was a significant increase in the score. Of the students, 88.89% students felt that this experience motivated them for self-learning and that on-line case discussion should become a compulsory part of residents training programme. Of the faculty, 85.71% strongly felt the major advantages were 1)chronic cases-teaching, building a repository of rare cases 2)exposure of students to problem-solving and decision-making 3)flexibility of teaching sessions in terms of time. Conclusions: By adoption of an Electronic-Hospital-Records- cases fed in digital format, students can learn in a simulated environment with interdisciplinary team collaboration and integrated teaching. EMR and HCIT has the potential to revolutionize medical education. [Krishna K et al NJIRM 2013; 4(5) : 118-121]

Key Words: Electronic medical records, medical education, Health care information technology.

Author for correspondence: Dr. Kavita Krishna, Bungalow no.23, Sopan Baug Coop Hsg Society, Pune 411001, Maharashtra. Email: kavitakrishna2006@gmail.com

Introduction: Need for Innovation : Medical students need to cope with the increasing adoption ofHealthcare information (technology (HCIT), or quality health services. HCIT, though available at many institutions, are underutilized. With increasing shortage of good clinical teaching material and shortage of clinical teaching faculty, e-learning helps in supplementing a lecture/demonstration by an on-line tutorial. This kind of "blended learning" helps in meeting the deficiencies of the exclusively traditional teaching methods. Besides, with the time constraints, it offers a collaborative, on-line/web-based learning, with a flexibility that would enable the students to learn at leisure.

Clinical informatics is the scientific discipline that seeks to enhance human health by implementing novel information technology, computer science and knowledge management methodologies to prevent disease, deliver more efficient and safer patient care, increase the effectiveness of translational research, and augment biomedical knowledge access. HCIT has a potential in patient care as well as medical education but is underutilized. In the last few years, there has been an increasing adoption of HCIT to improve operational efficiencies, patient safety and quality medical care. Electronic medical records (EMR) and an integrated HCIT built around EMR is going to be the mainstay in the coming years. Cerner Corporation's academic solution (AES), a software from a US-based company(Bangalore), is an EMR

based academic solution bringing conceptual and practical applications of information technology to the clinical learning process.

We carried out a pilot project at our institute. The Objectives were: 1) to sensitize the faculty and students of the medical college to the concept of clinical informatics and train them 2) to assess various features and functions of Cerner AES, usefulness and applicability in an Indian medical educational setting.

Description of Innovation: The project was carried out over 8 weeks as a pilot study. Seven faculty and 18 post graduate students (residents) participated. They were sensitized to and trained in using the software at the BVUMC digital library. All participants were given user-ids and passwords. Faculty participants were trained in building real/ fictitious cases into the system, entering the laboratory data, ECG/ radiology images, allergy information, order entries (medications, investigations).

http://www.cerner.com/solutions/education_and_training/academic_education_solution/

Message centre was used for giving and answering the assignments by the students. Key-functions like accessing links to medical terminology and reference material on diagnoses and pharmacology were utilized. The students had a point-of-learning ability as they accessed medical literature and interdisciplinary management of the case. Cases were built up step by step, so students were encouraged to evaluate and opine on patient’s status, differential diagnosis, further investigations and treatment. The questions were put up on each aspect by the faculty, and students uploaded their answers individually. The faculty evaluated their answers and throughout the course, the system tracked and stored the performance of the students There was a constant liaison with the Cerner executives regarding any technical issues. Every week, a new case was put up, the students could respond to the questions, put up their queries, as per their free time; the faculty responded and assessed each of them separately. There was a one-to-one interaction

with the students, on-line and separately, on a daily basis.

Results: Post-test and a retrospective pre-test was conducted for the students. The test was of 20 marks, based on an MCQ test mainly knowledge based questions, with some application questions with case scenarios, covering all the topics on the cases discussed during the project. Evaluation of the scores revealed that the innovation method and software was effective. The mean scores out of 20, pre and post test were 12.389 and 14.333. Paired T test and confidence intervals were used for statistical analysis. T value was -5.93 and $p < 0.0001$, i.e. post test score was significantly increased (Fig.1 and Table 1)

Table1:Paired T-Test and CI: Pre and Post Test

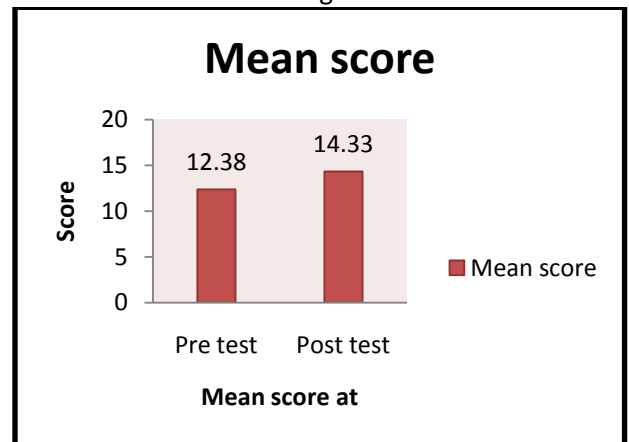
	N	Mean	SD
Pre	18	12.389	2.404
Post	18	14.333	2.249

95% CI for mean difference: (-2.637, -1.252)

T-Test of mean difference = 0 (vs not = 0):

T-Value = -5.93 P-Value = < 0.0001

Fig.1



Feedback: was collected from the participants about the project and EMR/e-learning as a learning tool. There were 12 questions in each feedback (for faculty and the students), 10 were based on a 5-point Likert scale and 2 open ended. All agreed that it was a good learning tool and the project sensitized them to the process of utilization of EMR and HICT. Of the students, 88.89% felt that

this experience increased their confidence and opportunity to ask questions directly to the faculty. It motivated them for self-learning, clinical problem solving and decision making. They felt that knowledge, awareness and skills of EMR is important, and on-line discussion should become a compulsory part of resident's training program. All of them appreciated that the flexibility of time made the learning at leisure and they had a good one-is-to-one interaction with the faculty. Of the faculty, 85.71% strongly felt that the major advantages were 1) chronic case - teaching, building a repository of rare cases, in the absence of actual patients, and the step wise discussion 2) exposure of the students to problem-solving and decision-making 3) a good supplement to bedside teaching, though not a substitute. 4) All the faculty also appreciated the advantage of flexibility if teaching in-terms of time.

Regarding accessibility and simplicity of the software, suggestions from all the participants were to simplify the software to a more user friendly one, reduce the number of tabs and options.

Discussion: There is a definite need to update and modernize health professional education and to include the integration of EMRs with formal introduction of EMR training and related information technologies in the medical curricula is one field to be explored. E-learning has gained popularity in the recent years and its use has been highly variable among medical schools.¹ Various aspects of EMR based education for medical students have been explored and studied. Results indicate that EMR technology can be usefully integrated into problem-based medical education. Kushinuk et al² undertook a project, to integrate the use of EMRs into a problem based module for 200 undergraduate medical students, with the aim of preparing medical students for practice involving the use of EMR, a need of the time. The "case of the week" was put up to small groups of students via an EMR specifically modified for the purpose. The students rated the sessions favorably.²

Used effectively by skilled teachers, EMR can be an impressive tool for clinical teaching and quality improvement and performance review. It can enhance history-taking and physical examination skills of medical students. EMR prompts improve their history questioning and documentation. With changing times, as patients will demand increasingly demand electronic communication from their providers, EMR communication skills should also be taught in medical schools as an integral part of basic communication skills.^{3,4,5}

It is felt that medical curriculum should have an introductory HICT course early in the pre-clinical training in order to promote development of medical information literacy and its continual evolution throughout the medical curriculum. The course can be made more relevant and interesting by employing the PBL (Problem based learning) approach.^{6,7} While training the students, an imperative prerequisite is the faculty training too. Two other issues are - introduction of EMR that blends with the existing curricula, and that the introduction of these technologies must be done without taking time and emphasis away from teaching of basic biomedical fundamentals and principles of medical practice⁸

There are other challenges and concerns too. Will electronic templates used as prompts reduce the student's ability to take basic history and physical examination skills? Is it threatening the physician-patient relationship? Will it adversely affect the clinical teaching and learning environment? To alleviate these fears, what we need, is optimal teaching methods, balancing all, and taking the best of each. E-learning, in any form, is a supplement, not a substitute to bed-side teaching. Another challenge is, the difficulties faced due to lack/shortage of faculty trained with HCIT/EMR/PBL approach.³ Also, as the industry is moving educational institutions into an electronic format, educators must attempt to determine where this visually entertaining form of communication is most cost-effective in the education process.⁹

To conclude, the advances in information and communication technology is bringing about

drastic changes in our society, and engulfing all facets of education. Medical curriculum, with its expansiveness, depth and ongoing learning process, is no exception. So, while on one hand, HCIT and EMR is exciting, innovative and welcome, optimum utilization of the technology is necessary to achieve desired benefits.

Conclusions : E-learning, HCIT and EMR is the need of the time and can facilitate, transform and revolutionize medical education. But it needs to be better utilized as a teaching and learning tool and should be incorporated into medical education. By adopting an EMR – cases fed in digital format, students can learn in a simulated environment with inter-disciplinary team collaboration and integrated teaching. Use of EMR allows clinicians across the care continuum to communicate seamlessly, a critical factor to effective collaboration. The EMR adopted should be simpler and user friendly. The joint venture of BVUMC with Cerner AES – holds promise! It is essential to recognize the need, meet the challenges and implement it.

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