

Computer Based Medical Education Using Cirrhosis as the Model for Education

*M HAROON *F IMAM **R HAROON

*King Edward Medical College, Lahore, **PMRC research center, Lahore, Pakistan.

Correspondence to: Dr. Mushtaq Haroon Associate Professor.

In the last 5 to 10 years computers have entered all walks of life especially communication and education. The need to adopt to new innovative methods of transfer of knowledge needs to be emphasized. Our study using a common topic like cirrhosis of liver as a model of learning provides evidence that using computers to impart knowledge is a fruitful and effective way. Interaction, concentration and involvement of the student are better attained.

Key words: Computers, medical education, cirrhosis.

Computer based medical education and learning is increasingly becoming an important tool in the education system in the west. Although time consuming to develop initially but the diversity of usage outweighs the time constraints. Computer based teaching programs are a useful and feasible alternative to lectures¹. Computer-based learning materials have the potential to be valuable learning resources for medical education². However, it has failed to realize its potential primarily because of unstructured approaches towards design and development². Changes are occurring in the undergraduate medical curriculum in the UK³. This can be seen by the general moves towards computer-based teaching in higher education and the recommendations for the new medical undergraduate curriculum by the General Medical Council³. The aim of the study was to determine the impact of the computer technology on the students compared to conventional methods of teaching via lectures and theory.

Material and Methods

A pentium 166Mhz MMX with 32 MB RAM, Gamma Galaxy video capture card, S3 VGA card, 8x CD ROM, 16 bit sound card was used to prepare the teaching material. Images of patients were captured on video and transferred to the computer through the image-grabbing card. They were processed using Photoshop 4.0 and Ulead Mediastudio Pro 2.5 software programs. Astound for Windows was used to prepare interactive multimedia presentations with animations, sound and transition effects. A question answer format was used to navigate through the program. Ulead Mediastudio Pro 2.5 was also used to compile an album of various medical signs. The slide show was used to show the signs in a self running program with a question answer format. Fifteen randomly selected students from third and fourth year classes of Allama Iqbal Medical College, Lahore were shown the presentations and allowed to use the computer to learn about the disease. Another thirty students randomly selected were taught on conventional lines with theory lectures and bedside teaching served as controls. There were equal number of males and females in each group. Only those students were selected who had passed all previous examinations in first

attempts. There were also proportionally equal number of students from third year and fourth year in each group.

Group-1 was taught cirrhosis the conventional way with theory. They were described signs of liver cell failure and portal hypertension and were given bedside teaching. The second group-2 was also taught the same subject, but computer technology was used to simulate patients with interactive teaching methods and pictures were shown of each of the signs of liver cell failure and portal hypertension in addition to bedside teaching. After a period of 4 weeks both the groups were evaluated on patients. An OSCE type of examination at the bedside of the patients was held to assess the knowledge of the student. The students were supposed to pick simple findings in the patient in relation to liver cell failure and portal hypertension. A total of 25 questions were also asked in a multiple choice written paper. Slides in the examination were different than the ones shown to the students using computer for learning. The marks of each student were aggregated as a percentage and the average calculated.

Results

Both the groups were made to identify signs of liver cell failure and portal hypertension at the bedside on the patients and were given a set of 25 multiple choice questions related to the topic. In group-1 with 30 students (15 boys and 15 girls) the score of the OSCE was 55% with liver cell failure and 59% with portal hypertension. In group-2 with 15 students (7 boys and 8 girls) on the other hand students scored 78% in liver cell failure and 83% in portal hypertension.

Category	Liver cell failure	Portal hypertension
Group -1	55% score	59% score
Theory based group		
Group -2	78% score	83% score
Computer based group		

(LCF = liver cell failure. PHTN = Portal hypertension)

There was no statistical difference between the results in either group between male and female students. The lowest marks in group-1 was 24% compared to 38% in group-2.

On the other hand the highest marks in group-1 was 74% while in group-II it was 92%.

Rating of the computer based medical education was achieved by a questionnaire where the following results were obtained.

1. Did not find it useful in 0 out of 15
2. Found it useful but needs improvement in 3 out of 15
3. Found it very useful in 5 out of 15
4. Would love it to be a regular method of teaching in 7 out of 15.

Discussion

Teaching methods supported with visual effects, animations and video clips leave a stronger impression in the brain. Difficult areas like complex problem solving and patient simulation help achieve real life situations and generate interest of the student. It is difficult to give full attention for long periods but with interactive computer interface this can be better achieved. With interactive teaching aids the student gets involved in the game like format of the presentation and attention is gained for a much longer time and leaves a lasting impression in the gray matter.

Pictures rather than words leave a longer lasting impression. In previous papers by the author in one using cardiology as a model and learning sounds through computer⁴ proved quite useful and was very well accepted by the students. In the other using neurological images the students also demonstrated better results when compared with regular teaching methods⁵. In a similar study applied to fourth year medical students using hypertension as the topic for learning by Fasce E et al¹ the experimental group had higher grades in the test than controls (71.4 and 64.6% respectively $p < 0.001$) and a highly favorable opinion of the program. It was concluded that computer based teaching programs are a useful and feasible alternative to lectures^{1,4,5}.

In another multicentric educational study was highly rated by fourth-year medical students using programs in cardiology⁶. The economies and strengths associated with multimedia computer-assisted instruction program make it an attractive solution to a number of problem areas, and it will likely play an increasingly important role⁶. In the paper titled "Active computer systems for medical education: approach and implementation" the author discusses methodological bases and ways of building and using the new type of the educational computer-aided systems for physicians⁷. A game like interface is used in which the system stimulates clinical cases while the user analyzes them to make decisions. Images, videos and presentations on latest computer software programs like Astound, Harvard graphics and Power point leave a lasting impact on the audience and should be used in modern lectures where possible. In our study we used similar methods of teaching with favorable effects. Simulations of clinical scenarios for medical education can take a number of forms, including paper-based tutorials, interactive computer programs, and Standardized Patients. Where

appropriate patients are not available, as is mostly the case at one particular moment, to create simulations on a computer is helpful and better than the low-fidelity simulation of paper-based tutorials. The C-ASE (computer-assisted simulated examination) project⁸, developed to test this hypothesis, incorporated a simulated three-dimensional environment and digital video of patients and clinic staff.

The advantages of using computer assisted pictorial method of medical education are as follows:

1. Simulated patients in form of picture or a sign available all the time.
2. The power of handling a large collection of pictures in thousands of colors.
3. The power to enhance the clinical signs by various editing software.
4. An interactive game like interface.
5. A question answer format.
6. Learning through integration and problem solving interface rather than simple recall.
7. Learning at home possible (if student is computer literate and has one at home).
8. Self learning possible (consultant may leave the students to work on their own).
9. Cost effective and saves time in the long term. The program can always be altered to address new problems and other learning areas in the same subject.
10. Images can be sent to distant places where facilities or patients are not available⁹.

Problems with this system of education.

1. An average speed computer must be present in the department.
2. A group of 10 to 15 students may be taught at one time.
3. A video projector must be present for larger audiences.
4. Interaction is best achieved when there are about 2 to 3 students per computer.
5. Initial preparation cumbersome and time consuming.
6. Collection of a large data base.
7. It is not an alternative to bedside patient evaluation.

Since the last 10 years the Association of American Medical College's GPEP Report has emphasized that medical schools should incorporate the training in the use of computer technology into their curricula. With the easy access to the Internet and the information super highway, the need for such changes has grown even more compelling. In a paper by Koschmann¹⁰, he argues that teaching medical students to be computer-literate will enable them to use information technology competently. One is thus better able to assess the adequacy of one's knowledge and to efficiently rectify deficiencies. In our study with the small number of students in each group although the results were not statistically significant, probably because of the smaller sample size. It is not surprising to find that education through the use of computers afforded a high degree of acceptability to the students in our study. The method of teaching was highly

rated by the students at the end of the study where most (12 out of 15) found it very useful while a few thought (3 out of 15) it needed further improvement. In a rapidly changing environment of learning we need to redefine our methods of education and use the computer in different ways to better train our young students for tomorrow.

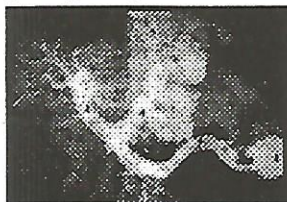
Conclusion

Computer based medical education is an effective method of teaching and serves to stimulate the student into interacting with the simulated patient in a game like fashion. This format clearly helps the student to remember the facts and visual information presented. This technology should be freely used in conjunction with traditional bedside teaching. The students should become familiar with this technology to gain the maximum benefit. The future of education lies in part in the proper use of this technology especially where patients are not readily available or where the ratio of the number of student to patient is unacceptably high.

MCO's given in the student assessment.

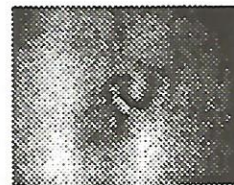
T = true F = False

1. In relation to Spider angioma
 - a) They may be seen in rheumatoid arthritis F
 - b) May be seen in choriocarcinoma T
 - c) Are related to catecholamine imbalance in cirrhosis. F
- 2) In relation to clubbing the following are true
 - a) It is seen in ulcerative colitis T
 - b) In cirrhosis clubbing may be associated with white nails T
 - c) In cirrhosis clubbing may be associated with white bands on the nails. T
 - d) In chronic malabsorption syndrome clubbing is seen. T
- 3a) Normal pressure in the portal vein is 8-10cm of saline F
- 3b) Normal pressure in the portal vein is 10-15cm of saline T
- 3c) In Portal hypertension the pressure in portal vein is usually > 30cm of saline T
- 4) Name anatomical sites labelled 1 to 5 on the splenoportogram.



1. Spleen
2. Splenic vein
3. Portal vein
4. Left gastric vein
5. Esophageal varices

5.
 - a. Micronodular cirrhosis may be seen after VH-B infection? F
 - b. Deputrayan's contractures are seen in alcoholic cirrhosis? T
 - c. Parotid enlargement is seen in nutritional cirrhosis? F



- d. In cirrhosis 80% of patients presenting with hematemesis bleed from esophageal varices? F
- e. The direction of flow of blood in portal hypertension is centripetal (towards the umbilicus)? F

6. What sign is shown in each of the pictures below?

A	B	C
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 a) Deputrayan contracture, b) Caput Medusae, c) Esophageal varices

At the bedside the students were made to pick up the following:

1. Clubbing with white nails.
2. Dilated veins on the abdomen.
3. Spider angioma
4. Early jaundice
5. Axterexis
6. Gynaecomastia
7. Splenomegaly
8. Scratch marks in primary biliary cirrhosis
9. Xanthlesma in primary biliary cirrhosis
10. Bruising

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