Introduction of Clinical, Simulation-Based Software for Medical Sciences Teachings

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Abstract

Introduction - Simulation is the gold standard for training in aviation and trauma medicine. Now it is available for diseases diagnosis and treatment. With simulation, clinicians can practice their art in a realistic, consequence free environment, combining both theory and practice in a comprehensive program. Method and materials - In the virtual clinical environment of “VPsoft mentor” software, the practitioner reviews a patient’s history, orders laboratory tests and procedures, interprets findings, renders diagnoses, and prescribes medication. Every diagnostic or treatment decision the clinician makes for the patient is analyzed by E-mentor, providing instant feedback. Results - This software have been used in our academic centre in Arak, as part of residency evidence based learning in a schedule of the small group teaching which, by comparing two groups of case and control, we detected meaningful differences in the Objective Structured Clinical Examination (OSCE) evaluation scores between them. Discussion / Conclusion – Expert systems-based virtual patient simulation shows promise as a mechanism for assessing practitioner skill, detecting skill gaps and for electronic mentoring. Using CD-based clinical simulations it is possible to augment clinical sciences training globally at low cost with high clinician acceptance, in order to track improvement over time.

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1-Introduction

Novel artificial intelligence-based software systems are becoming available to improve the quality of patient care by measuring clinician behavior and targeting interventions to improve performance and reduce medical errors.
We designed an interactive computer-based simulation and data analysis program in which practitioners can manage virtual patients with vast arrays of medical conditions. The aim of this approach is better education by implementing self-directed learning opportunities using clinical case simulations installed on computers in university sites, libraries or at home. This software has been designed in two languages of Persian and English.

2-Method and materials

Using an interactive virtual medical records interface, clinicians receive electronic mentoring and testing (dual mode) by reviewing histories, ordering tests, making diagnoses among hundreds of choices, and choosing treatments from more than hundreds of medications and other therapies [Fig1,2,3]. The simulations can allow or hide in-session diagnostic and therapeutic information, which is produced by an expert system-based artificial intelligence engine (A.I.). The A.I. provides guidelines and evidence-based feedback on the appropriateness of choices. Finally, the simulation shows an explanation of reasonable choices for the case, a mini-review of the general topic, and the user’s errors, warnings and deviations from guideline, evidence and expert consensus-driven recommendations. All choices are recorded for analysis.

Fig. 1. Reviewing History

Fig. 2. (a) Ordering Tests; (b) Making Diagnoses and Choosing Treatments
Advice and warnings are offered during the simulation, and an educational summary, including scores and a breakdown of any warnings, is provided at completion. Published treatment guidelines from UpToDate are used to assess the appropriateness of management choices and provide feedback.

![Fig. 3. Analysis and Scoring of recorded choices](image)

### 3-Results

It is becoming increasingly difficult for general physicians and internists to keep track of the explosive growth in new developments in drugs, diagnostics and medical research on an ongoing basis. VPsoft mentor has introduced a significant solution for educating and the training of more healthcare professionals with a faster and better method than any other. “Vpsoft mentor” software has special capabilities that make it invaluable to medical educators, physicians and medical students such as:

- A full pharmacological database of all approved medications with interaction and dosing
- A comprehensive clinical decision support system designed to make learning activities interactive
- A medical patient simulator, especially rare or emergency conditions
- Authoring tools to create physician own patient simulations

At present, we use this software in our academic center in Arak, as part of residency evidence based learning in a schedule of the small group teaching. Last summer, we arranged our internal medicine residents (n = 20) in two groups of case and control. Case group participated in educational program named as “Clinical approach to patient” and the control group only informed by history and diagnosis of discussed patients. Neither of two cases and control groups were aware of Objective Structured Clinical Examination (OSCE) content or design. An OSCE is a modern type of examination often used in health sciences to test clinical skill performance and competence in skills such as communication, clinical examination, medical procedures / prescription, and interpretation of results. By comparing two groups of case and control, we detected meaningful differences in Objective Structured Clinical Examination (OSCE) evaluation scores between them (p<0.05). It is clear we need to follow similar studies with larger sample sizes for a better conclusion.
4-Discussion/Conclusions

Traditional clinical training methods are expensive and non-standardized, provide passive learning without real-time detailed assessment of knowledge gained, remove clinicians from the practice setting, and their impact is difficult to measure. Simulation of the clinical experience begins as a virtual “patient”. presents the clinician with his or her “case” – an actual patient or standard patient case that has been translated into a clinical, computerized encounter that tests the “student(s)” as they move through the logical process of assessment, ordering and interpreting labs, diagnosing, and prescribing meds along with real-time mentoring feedback. As each clinician moves through cases specifically selected to improve skills in certain critical areas of expertise, the simulator records their scores performance based on relevant, irrelevant or missed programmed switch.

Implementing an on-line clinical teaching tool that is configured to update a best practices “rules engine” (e.g. new contraindications, new laboratory tests, latest FDA warnings, latest clinical trial citations) across a spectrum of diseases and conditions has recently been proven to be effective in quantifying the behavior of clinicians and healthcare teams in the classroom and in the field [1-3]. Using an internet-based clinical simulation program, have augmented global HIV, HBV, HCV and vaccine mentoring and training [4-8].

We hope, by improving this software and applying it in a web-based method as an e-learning initiative, the Vpsoft mentor program can be rolled out to many more students in a fraction of the time and at a fraction of the cost of traditional classroom based training.

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References

