

Title: Improving cardiovascular clinical skills in undergraduate students.

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Context and setting: Cardiovascular diseases are the main cause of death worldwide. Although clinical history and physical examination are sensitive and highly specific methods of screening, the technological development in cardiovascular diagnosis has placed the cardiovascular anamnesis and physical examination in a second plan, making the teaching of it difficult in undergraduate medical education. Cardiovascular skills are seemingly in decline, and trainees often perform physical examinations inaccurately. The Interactive Space-Education (ISE) is emerging as an innovative tool of online education, which combines the pedagogical merits of both the 'spacing effect' and the 'testing effect'. Research has showing that spacing or repeat presentation, at intervals, increases knowledge and improves retention.¹ As ISE utilizes traditional web-pages for the submission of answers and for the presentation of learning points, it should be possible to use all of the functionalities of web-pages within the ISE program to meet the training needs of care providers.

Why the idea or change was necessary: Considering the increasing prevalence of cardiovascular diseases and its impact on mortality, the aim of the study was to improve cardiovascular clinical skills by using an innovative methodology of ISE.

What was done: A randomized controlled trial involving 48 students of second year medical course, divided in two cohorts. Participants in cohort 1 received spaced education twice a week for 13 weeks (March to June 2010), each of which contained an evaluative component (a multiple choice question based on a clinical scenario) about cardiovascular anamnesis and physical examination and an educational component (the correct answer, the take home message). Participants of cohort 2 formed the control group and did not receive the spaced education. All students were assessed by written test and Mini CEX to assess cognitive and cardiovascular clinical skills respectively. Additionally, at the end of the study, a questionnaire was carried out to evaluate the use of the ISE as a new teaching and learning tool. A descriptive statistic was performed and means were also analyzed by 2-tailed t student test.

Evaluation of the results or impact: ISE was completed by 88.9% students. Cohort 1 grade of the written test was higher than cohort 2, the cohort 1 and 2 mean grade was 7.17 ± 1.06 and 5.88 ± 1.12 , respectively ($p < 0.0001$). The mean grade obtained by Mini CEX were also significantly higher in cohort 1 (8.64 ± 0.60 and 7.42 ± 1.31 , $p < 0.0001$). The majority of participants (75%) believed that ISE greatly contributed to their learning. The contribution was related to theoretical knowledge in 43.5% while 56.5% of them considered the contribution not only in theoretical but also in practical ability. The delivery frequency was excellent for 39.1% of the students. The totality of them would indicate ISE for another student. Despite the fact an online education tool might be important to improve cognitive ability, the ISE also allow an expressive improvement in clinical skills ability. ISE was effective and well-accepted form to increase cardiovascular knowledge which may contribute to a better the general medical practice.

¹ B. Price Kerfoot, BP, Armstrong, EG, O'Sullivan, PN. Interactive Spaced-Education to Teach the Physical Examination: A Randomized Controlled Trial. J Gen Intern Med, 2008; 23(7):973-8