Annotated List of Research Studies Published in Peer-Reviewed Journals
Research Studies

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An mHealth intervention to improve nurses’ atrial fibrillation and anticoagulation knowledge and practice: the EVICOAG study 1 August, 2018, http://journals.sagepub.com/doi/full/10.1177/1474515118793051

The aim of this study was to evaluate the efficacy of EVICOAG – a novel mHealth, smartphone-based, spaced-learning intervention on nurses’ knowledge of atrial fibrillation and anticoagulation.

Alice E Barsoumian, Heather C Yun.

Augmenting Fellow Education Through Spaced Multiple-Choice Questions

The San Antonio Uniformed Services Health Education Consortium Infectious Disease Fellowship program historically included a monthly short-answer and multiple-choice quiz to ensure medical knowledge in relevant content areas that may not be addressed through clinical rotations, such as operationally relevant infectious disease. Over time, faculty noted increasing dissatisfaction with the activity. Spaced interval education is useful in retention of medical knowledge and skills by medical students and residents. Its use in infectious disease fellow education has not been described. To improve the quiz experience, we assessed the introduction of spaced education curriculum in our program.


A Team-Based Online Game Improves Blood Glucose Control in Veterans With Type 2 Diabetes: A Randomized Controlled Trial. Diabetes Care 2017;40:1218–1225 | https://doi.org/10.2337/dc17-0310


Educational programs are frequently developed to improve the knowledge of medical trainees. The impact of a program may be limited if there is no follow-up to reinforce the message. Online Spaced Education (SE) has been developed to address this limitation. This study was performed to assess whether an SE program would improve the impact of a didactic seminar.


Using spaced education to teach interns about teaching skills.


Using spaced education to improve interns’ teaching skills is a potentially powerful intervention that improves interns’ enthusiasm for teaching and teaching effectiveness. The changes are mirrored in students’ ratings of interns’ teaching skills and interns’ attitudes toward teaching.

This pilot study in Ethiopia demonstrates that the spaced education methodology is acceptable and effective for the acquisition of knowledge in a low-resource context for course participants with a clinical or public health background and moderately reliable Internet access.


This randomized trial at two Harvard teaching hospitals showed that the spaced education methodology improved both the self-reported confidence and patient-safety behaviors of resident physicians in a simulated scenario, compared to control residents receiving traditional online training (online slide show followed by a quiz).


Involving 1470 physicians in 63 countries, this randomized trial demonstrated that the spaced education methodology with game mechanics can substantially improve guidelines knowledge and is a well-accepted method of global CME delivery.


This trial involved 731 students at 3 US medical schools and showed that the spaced education methodology combined with game mechanics is an effective and well-accepted means of teaching core content and is a reliable and valid method to assess student knowledge.


Involving 931 urology residents from the US and Canada, this trial demonstrated that the spaced education methodology combined with game mechanics is a reliable and valid means to assess residents' knowledge and is a well-accepted method by which residents can master core content.

This randomized trial among 246 clinicians provides evidence that spaced education following a live CME course can significantly increase the impact of a face-to-face course on providers' self-reported global clinical behaviors. This study won the 2012 Award for Excellence in Research, from the Journal of Continuing Education in Health Professions, recognizing "the best research article published in JCEHP" in 2012.


This 34-week randomized trial involving 1067 students at 4 US medical schools demonstrated that the spaced education methodology can identify poorly performing students and improve their longer-term knowledge retention by 170%.


This 108-week randomized trial involving 95 clinicians in 8 northeastern hospitals showed that the spaced education methodology durably improves the prostate cancer screening behaviors of clinicians by 40%. This is the first study demonstrating that spaced education can durably impact the behaviors of participants.


In this 45-week randomized trial involving 724 urology residents across the United States demonstrated that the spaced education methodology generates transfer of histopathology diagnostic skills and substantially improves their long-term retention.


This pilot study demonstrates that online spaced education is an effective and well-accepted supplement to a live CME course.

This randomized trial provides evidence that the spaced education methodology with adaptive game mechanics can increase learning efficiency by more than 35%.


This randomized trial among 480 clinicians demonstrated for the first time that the spaced education methodology is an effective and well-accepted form of graduate- and continuing-medical education and is a promising new methodology to improve knowledge of clinical practice guidelines.


This study analyzed whether the learning gains among the residents in our 2007 spaced education trial persisted after two years. They did! These results are particularly striking since these residents' on-the-job training over these 2 years would have worked to erode any knowledge differences between the cohorts that were attributable to the spaced education methodology. Given this, the ability to demonstrate a knowledge difference between cohorts 2 years after the spaced education intervention is remarkable.

Matzie KA, Kerfoot BP, Hafler JP, Breen EM. Spaced education improves the feedback that surgical residents give to medical students: a randomized trial. Amer J Surg 2009: 197(2), 252-257.

This randomized trial employed the spaced education methodology to improve the feedback that surgical residents give to medical students. The medical students were blinded to which residents received the spaced education. Even so, the students (the blinded, down-stream receivers of the feedback) reported that the feedback given by residents who received the spaced education was significantly more frequent and of higher quality.


This 18-week randomized trial among medical students at Harvard demonstrated that the spaced education methodology can generate significant improvements in knowledge of the physical examination and is very well-accepted by students.


This randomized trial among 115 medical students at Harvard provides evidence that spaced education delivered prospectively can generate significant, topic-specific learning.

This pilot randomized trial among 97 medical students at Harvard showed that moderate clustering of content within the spaced education methodology does not have a large effect on learning and retention. A substantially larger trial (128–788 students for 0.8 power) is needed to investigate if clustering has a small-to-moderate impact on learning and retention.

Kerfoot BP. Interactive spaced education versus web-based modules for teaching urology to medical students: a randomized controlled trial. J Urol 2008; 179, 2351-2357.

This randomized trial demonstrated that, within the compact time frame of a clinical clerkship, spaced education is equivalent to web based teaching in short-term learning gains and in acceptability by medical students. In addition, the study found that ISE is able to generate substantial improvements in knowledge from one cycle to the next.


This randomized trial among 537 residents across the United States and Canada demonstrated for the first time that the spaced education methodology improves the acquisition and retention of clinical knowledge.


This is the first randomized of the spaced education methodology. The study demonstrates that spaced education consisting of clinical scenarios with questions and explanations distributed weekly can significantly improve students' retention of medical knowledge.
About Qstream

Qstream is a field development micro-learning platform used by leading enterprises across all industry sectors, including life sciences, healthcare, financial services and technology, to support their field teams and front-line managers do their job better. Developed at Harvard, Qstream’s scientific approach has been validated in more than 20 randomized control trials to boost individual’s professional proficiency and durably change behaviors in just minutes a day using any mobile device.