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Publication Date

1998

Peer reviewed

A System for Pilot Testing Clinical Knowledge Questions Using Pseudo-anonymous Electronic Mail

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Background. Many physicians are unaware of the best evidence for managing common conditions such as coronary disease,¹ and preventable adverse outcomes continue to result.² Better physician teaching could improve public health, but to evaluate new teaching methods, reliable and valid knowledge tests are needed. We developed an information system that uses pseudo-anonymous electronic mail to protect the identity of physician volunteers while they test clinical knowledge questions.

Methods: System. The system has two distinct modules, both written in the Perl 5 language.

The Test Design Workbench manages questions, generates quizzes, and analyzes quiz results. Designated users write and edit multiple-choice questions using a Web interface. Questions are grouped in sets of 2–4, each set being introduced by a brief clinical vignette. The software generates quizzes for each physician subject by randomly drawing a vignette from the pool. It then sends these quizzes to the Mail Server for distribution. Subjects are identified in this module only by a code number (a pseudonym). When subjects return their answers the Workbench automatically returns correct-answer explanations.

The Mail Server anonymizes all communication with subjects. When a potential subject returns their email enrollment form, the Mail Server randomly generates the subject's code number and sends the code number to the Workbench. The Workbench then sends quizzes to the Mail Server, which forwards them by email to the intended subjects. When reply mail is received from subjects, the Mail Server extracts and sends to the Workbench only the subjects' code numbers and their answers to individual questions. The Mail Server module is designed to be held by a trusted third party, though it now runs on a secure Sun™ workstation in our department.

Methods: Evaluation. Our study was approved by UCLA's Human Subjects Protection Committee. We invited all UCLA faculty and fellows in General Internal Medicine, Cardiology, and Family Medicine to participate in testing questions about primary care management of coronary disease. We appealed only to their altruism. Of the 132 physicians invited, 38

enrolled (29%). In four rounds of questioning, involving 39 questions so far, 29 subjects have returned completed quizzes (22%). A mean score was calculated for each subject by averaging all individual quiz scores, regardless of our post-hoc judgment of individual quiz validity. SAS™ software was used for statistical analysis.

Results. Participating subjects are 3 cardiologists (10%), 5 family physicians (17%), and 21 general internists. Eight are female (28%). The overall mean quiz score was 63%. Fig. 1, below, shows subjects' scores by specialty. The group mean score for family physicians was 40%, for internists 65%, and for cardiologists 88%. ($P = 0.038$ for the one-way ANOVA by specialty).

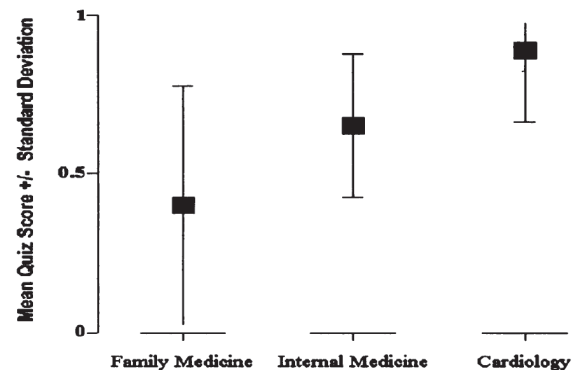


Figure 1. Mean \pm SD quiz scores, by specialty group.

Conclusions. Although a minority of our faculty are currently participating, their numbers are sufficient to show "known-groups" validity in testing a preliminary set of questions about coronary disease. We expect this system to enable the construction of reliable and valid clinical knowledge tests for use in future research on physician education.

References

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