Title

SAGE (self-study acceleration with graphic evidence): Web-based physician instruction on guidelines for care after myocardial infarction

Authors

Bell, DS
Mangione, CM

Publication Date

1999

Peer reviewed

SAGE (Self-study Acceleration with Graphic Evidence): Web-based Physician Instruction on Guidelines for Care After Myocardial Infarction

Douglas S. Bell, MD and Carol M. Mangione, MD, MSPH

Division of General Internal Medicine and Health Services Research,
Department of Medicine, UCLA School of Medicine, Los Angeles, California

Objective. To construct and evaluate a World Wide Web self-study system combining tutorial and statistical graphic simulation strategies.

Background. Many physicians in community practice do not know important evidence that should guide their care for myocardial infarction (MI),[1] despite the dissemination of printed guidelines. Computer-assisted instruction (CAI) could in theory improve learning from guidelines because it can be tailored to build on a learner's existing knowledge (a *tutorial strategy*), and it can interact with the user to demonstrate quantitative relationships among causes and effects (a *simulation strategy*).[2] We have combined tutorial and simulation strategies in constructing a Web-based instruction system for physicians called SAGE (Self-study Acceleration with Graphic Evidence).

Methods: System. Twenty learning objectives for post-MI primary care were written based on two nationally recognized guidelines. A pre-test and a post-test were constructed each with one multiple-choice question per learning objective. SAGE software was written using JavaScript, SQL, and Java. SAGE users enter their pre-test answers on a Web page, and they are then directed to the guideline passages relevant to the questions that they missed. A Java applet presents evidence from clinical trials using animated statistical graphics.
Evaluation. Internal medicine and family practice residents were recruited at 4 institutions. Participants attended a session that began with administration of the pre-test. Attendees were then randomly assigned to study from SAGE or from printed materials consisting of the two guidelines, pretest answers, and learning objectives. Subjects in both groups were asked to study until they felt they had met the learning objectives. They then completed the post-test and a standard CME satisfaction survey before leaving the session. Tests are scored with one point for each correct answer. Learning efficiency is each subject's pretest to post-test score gain per hour spent studying. Learner satisfaction is the sum of 5 CME satisfaction items, each scored from 1 to 4. Subject characteristics are compared between study-mode groups using chi-square tests. Mean outcome values are compared between study-mode groups using the Wilcoxon rank-sum test because each outcome is non-normally distributed according to the Shapiro-Wilk test.

Results. We enrolled 162 residents, 158 completed the post-test. Their characteristics were balanced between study-mode groups. Table 1. (below) shows that scores improved significantly from pretest to post-test in both groups. Post-test scores were similar between groups, but those randomized to use SAGE spent less time studying, resulting in greater learning efficiency. Subjects using SAGE were more satisfied with their learning.

Conclusions. Residents may improve their self-study efficiency and their satisfaction with learning by using a Web-based tutorial with graphic evidence rather than printed guidelines with a pretest. Further study is needed to develop Web-based instruction that motivates greater learning achievement.

References

1. Ayanian JZ, Hauptman PJ, Guadagnoli E, Antman EM, Pashos CL, McNeil BJ. Knowledge and practices of generalist and specialist physicians regarding drug therapy for acute myocardial infarction. N Engl J Med 1994; 331(17):1136-42.
2. Kulik JA. Meta-analytic studies of findings on computer-based instruction. *In:* Baker EL, O'Neill HF., eds. Technology Assessment in Education and Training. Hillsdale, New Jersey: Lawrence Erlbaum, 1994: 9-33.

Study mode	n	Pretest	Study Time	Post-test	Test gain/hr	Satisfaction
SAGE	82	9.8	29 minutes	14.3	10.5	17.0
Print	76	9.6	38 minutes	13.9	8.0	15.6
• *P*-value		.44	.0002	.43	.04	.0001

Table 1. Learning and satisfaction results from the randomized trial of SAGE vs. print self-study.

1091—8280/99/$5.00