

Title: INITIAL CLINICAL TRIALS OF A COMPUTERIZED "HEALTHQUIZ"  
TO SUGGEST PREOPERATIVE LABORATORY TESTS

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**Introduction.** Previous studies indicate that the number of preoperative laboratory tests can be reduced without adversely affecting patient care (1). Furthermore, unnecessary testing may be hazardous to patients because it can lead to pursuit and treatment of borderline positive or false positive results. In addition, extra testing probably increases medicolegal risk because only 30 to 70% of discovered abnormalities are noted in the patient's chart (2). Decreasing the amount of unproductive and possibly harmful testing (even excluding costs saved by avoiding iatrogenic disease) could considerably reduce costs. Blue Cross/Blue Shield, estimating that \$30 billion was spent on preoperative testing and evaluation in the United States in 1984, suggests that if only tests indicated by the patient's history were performed preparatory to surgery, \$12 to 18 billion could be saved. Despite the fact that many studies suggest that the above mentioned savings are attainable, selective testing is not the norm. Even when surgeons and anesthesiologists totally agree on indications for testing, 30 to 40% of patients who should have tests do not get them, and 20 to 40% of patients who should not get tests do get them (2).

Studies have shown the effectiveness of using a health history questionnaire to select the preoperative tests most likely to reveal abnormalities which could significantly affect perioperative care (1). Although the questionnaire method was effective, it required the additional expense of a nurse to interpret the results. This additional expense decreased the cost-effectiveness, and this cost was not borne by the same party benefiting financially from the reduction in testing. Thus, this paper/nurse system didn't work in most hospitals. The use of a Macintosh based system requires that the patients be computer literate, but most of our patients were not computer literate. Hence, we now investigate a simple automated system, a "HealthQuiz", in which the patient uses a small computerized device to answer ("Yes", "No", or "Not Sure") questions about his or her health history. A computer chip contains the algorithm that uses these answers to suggest the tests which would be most productive preparatory to surgery.

**Methods.** After IRB approval, and patient consent, the patients answered questions about their health on a four button lap top computer (the "HealthQuiz"). A self-contained computer chip contains the algorithm that integrates these answers with preselected indications for testing to suggest which preoperative tests would be most productive. The chip is removable and can be replaced easily by one posing questions in a different language. Recommendations regarding testing are based on indications predetermined and agreed upon by a panel of surgeons and anesthesiologists, and on results published in the literature. The "HealthQuiz" is connected to a printer to generate a printout of the patient's responses to the questions for the patient to verify and the physician to see. In addition to suggestions for testing, the anesthesiologist receives a printout of facts important for anesthesiologists to know (such as allergies and the presence of dentures), and a summary of the patient's symptoms. The physician then reviews the patient's history, lab test suggestions, and symptoms to determine which tests are most appropriate for each patient.

After completing the "HealthQuiz", each patient completed a short questionnaire to indicate satisfaction/dissatisfaction with the device and its ease of use. The printout from the "HealthQuiz" was made available to the anesthesiologist who was to order preoperative tests for the patient (if the patient's surgeon so indicated) or to supplement those already ordered by the surgeon. The printout also included the time it took the patient to complete

the "HealthQuiz". On the day of surgery, the patient's anesthesiologist indicated if any tests changed patient management, and if so, how it changed management. Postoperative chart review by an observer blinded as to how the laboratory tests were selected (i.e., with or without use of the "HealthQuiz") was used to indicate what percentage of tests obtained were abnormal and if a change in perioperative care, including further testing or postponement, was due to an abnormality in a laboratory test. Complications within 24 hours of surgery were also recorded.

Statistical analysis included the number and percentage of tests that would not have been obtained if the "HealthQuiz's" suggestions had been used to indicate tests ordered instead of surgeons' preference, and the number and percentage of abnormalities found on those tests that the "HealthQuiz" suggested, but were not ordered by the patient's surgeon. The percentage and number of patients with abnormal tests, the percentage and number whose care was altered due to tests, and the percentage and number with complications were segregated by tests obtained by "HealthQuiz" indications or by surgeon preference.

**Results.** Of the first 196 English speaking patients asked to take "HealthQuiz", 195 did so and completed "HealthQuiz" in an average of 8 minutes and 9 seconds. None of those 195 patients indicated dissatisfaction with the "HealthQuiz" device. For the first 50 patients analyzed, seven percent of those tests suggested to be ordered by "HealthQuiz" were more than borderline abnormal. No test which was not suggested by "HealthQuiz" was more than borderline abnormal or changed the management of the patient. Four tests not suggested by the surgeon, but suggested by "HealthQuiz" were significantly abnormal, and one of these changed patient management. These four tests constituted 20% of the extra tests suggested by "HealthQuiz" in these 50 patients. An unanticipated situation that may alter the planned analysis developed: quickly surgeons began to rely solely on the anesthesiologist to choose laboratory tests, and even anesthesiologists not involved in the study very rarely chose tests that were different from those suggested by "HealthQuiz".

**Discussion.** In this initial report of the experience of a small number of patients who utilized "HealthQuiz", it appears that "HealthQuiz" is readily usable and accepted by a wide range of patients. The use of the algorithm based on patient history seems to succeed where other methods failed: it is completed and its suggestions used by physicians to help them choose preoperative tests even when a research nurse is not present. Because there are only a limited number of patients who have completed "HealthQuiz" and who have laboratory tests regardless of the results of "HealthQuiz", the conclusions to date remain limited about the success of the "HealthQuiz" in suggesting all tests that alter patient management and in reducing iatrogenic disease. This study indicates that "HealthQuiz" deserves wider testing to determine if it will meet its promise of reducing costs and iatrogenic disease, and of helping the surgeon, anesthesiologist and hospital become more efficient while maintaining control over which tests their patients receive preoperatively.

#### References.

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