NEW TECHNOLOGY FOR MULTIPHASIC HEALTH TESTING

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Abstract

This paper comments on the early technology used in multiphasic health testing, and reviews the more significant advances in biomedical instrumentation, computer technology, programming techniques and medical protocols which have taken place over the past few years. Multiphasic health testing in its early stages was a new systems technology-first applied within the Kaiser-Permanente Foundation in the 50's and 60's, given a spurt during the late 60's and early 70's when industry decided it was a product ready to market, then languishing due to lack of physician acceptance and lack of third party reimbursement, and recently given new impetus through the growing popularity of Fitness programs and the increased emphasis on environmental health monitoring. The theme has shifted away from early disease detection and toward health monitoring, and most technological advances have supported this shift.

Introduction

The first multiphasic screening program within a comprehensive prepaid health plan was established by Kaiser-Permanente in 1951.1 With the advent of the digital computer and automated biomedical equipment the concept was expanded, and in 19642 the term Automated Multiphasic Health Testing (AMHT) was introduced by Kaiser. The word "automated" was intended to apply less to the automation of patient processing than to the processing of patient test data to separate positives from negatives and to apply advice rules.3 However, American industry did not make this important distinction and, in 1968 - excited about the establishment of four large U.S. Public Health Service AMHT systems and a promise by Congress of reimbursement under Medicare - a number of major corporations invested many millions of dollars to develop proprietary AMHT systems.4 These special purpose systems were quite expensive but many were installed in the United States and abroad. They were technological marvels in their day and, indeed, several of these systems - designed in 1968 - are still in use and are processing 100,000 or more patients a year in a variety of locations. They have some very grave defects by today's standards. First, they are quite special-purpose in an age where multi-tasking is almost mandatory. Second, and more important, their lack of a data base capability inhibits what has become the most important application - that of developing statistics to compare groups, exposures, health habits, and so on. Third, the self-administered medical history, one of the "raisons d'etre" of an interactive on-line system, is inflexible and cannot be changed without a complex procedure of making new 35 mm slides and re-compiling the branching logic.

The next generation of automated multiphasic health testing system was evolved in the 1976-1977 period. Emphasis shifted from automated data collection to automated data manipulation. In addition, organizations who hoped to survive financially decided that AMHT alone could not support a systems company, so they expanded their efforts to include group practice management information systems - administration, billing, accounts receivable, practice management, and the like. The first system combining multiphasic health testing and clinic management was installed in the University of Louisville Medical Center in 1978. This system took advantage of advances in computer technology; particularly the proliferation of minicomputers with data base management operating systems. The Microdate REALITY, Honeywell ULTIMATE, and Perkin-Elmer (Interdata) 7/32C were early contributors to this trend.
In parallel with this tortuous evolution in the United States, many countries with more highly structured health care delivery systems became natural homes for high volume multiphasic health testing systems. In Australia, for example, multiphasic health testing protocols are reimbursable procedures if carried out in approved facilities. In Japan, industrial groups and municipalities sponsor substantial AMHT programs and there is great physician support. For instance, a meeting like this in Japan would normally have at least 300 doctors in attendance. In countries such as Mexico, Venezuela, Poland, Israel and Greece there are large centers similar in size to the Kaiser facilities and supported by Government or Industry. I am not extolling their health care systems. The point is that the centers represent financially viable operations at a level of 75 to 200 patients per day, and hence they have supported programming which has advanced the art during a hiatus period in the U.S. I refer to technological advances such as the following:

1. Development of the Compressed Medical Record (CMR), which is an automatic year by year tracking of patient test data, patient health habits, and medical encounters.

2. Development of advanced statistical techniques to develop group profiles, group risk factors, etc.

3. Development of the concept of subject-specific normal ranges so that clinical data can be evaluated with respect to each individual's normal fluctuations as well as with respect to the conventional population-based normal range.

You will note that these types of important advances are the result of research using multiphasic health testing as the research tool.

In the last three years in particular, there has been a surge of development activity in the United States centered around the requirements for environmental health monitoring. Many of the lessons learned from the past have been applicable, but the emphasis has changed to monitoring in the workplace or adjacent to the workplace. New types of biomedical instruments using microprocessors have been developed to serve this market. One example is the self-administered vision tester, a device considered impractical before the emergence of the microprocessor. Another is the self-contained pulmonary function analyzer which provides a computerized output.

Conclusion

The multiphasic health testing system of the future will undoubtedly use self-contained data collection/analysis systems of this sort to develop refined data which will be fed to a central minicomputer, either on-line or in a batch mode. The minicomputer will develop health profiles, year-by-year projections of patient data, health risk appraisals, and subject-specific standards for future reference. Perhaps the most important function of the central minicomputer will be to maintain an ever-increasing data base and to perform statistical analyses to evaluate the impact of environmental exposure, health habits, and other factors as a quantitative guide to improved health care.

References

1. Colleen, M.F. and Linden, C. "Screening in a Group Practice Prepaid Medical Care Plan." J. Chronic Dis. 2 (1955): 400-408.


