

# Multiphasic Health Screening

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## Introduction

Although scientifically unproven, general empirical agreement supports the notion that the early detection of disease is beneficial in the control of the disease process. The aim is to discover and cure conditions which have already produced cellular or biochemical change but which have not so far reached a stage associated with symptoms for which medical aid is sought spontaneously (Wilson and Jungner, 1968). The various methods of early disease detection have evolved along with contemporary philosophical and technological developments.

One method, emphasized by the American Medical Association for the past 50 years, is the Periodical Health Examination (PHE). Many private practitioners and government and industrial physicians accept and utilize this method, but its widespread application in our growing population is severely restricted because of the shortage of professional medical manpower and the time required for each PHE. These facts, coupled with the patient's demand and the physician's inclination to give priority to the care of the sick, further reduce the chances of early disease detection through the traditional PHE approach.

Another method of early disease detection is the presumptive identification of unrecognized disease or defect through screening tests. Such tests are intended to sort out apparently well persons who probably have a disease from those who probably do not (Commission on Chronic Illness, 1957). Characteristically the tests, examinations or other procedures are applied rapidly by technical personnel with indicated follow-up diagnostic and treatment services performed by a physician.

## History

In the 1930's, and to a greater degree during the decade following World War II, official health agencies became advocates of screening programs for case finding and epidemiological purposes. This "first generation" of screening activity was disease specific (aimed at detecting a single disease by a single screening test) and is exemplified by serological testing of large population groups for syphilis and mass x-ray surveys for tuberculosis.

The subsequent development of new testing equipment such as the 70-mm photofluorogram, the vacuum tube for blood drawing, and the Hewson Clintron to determine blood glucose levels made it feasible to test for multiple diseases. This ability to combine several test procedures into a multi-test battery created a "second generation" of screening activity which became known as Multiphasic Health Screening (MHS). In the late 1940's and early 1950's MHS became very popular. Demonstration programs were conducted in many areas with notable examples in San Jose, California; Indianapolis, Indiana; Richmond, Virginia; the entire state of Alabama; Boston, Massachusetts; and Atlanta, Georgia (Chapman, 1950). The early programs demonstrated the potential value of screening for early disease detection as well as serious administrative and technical problems. Diagnostic follow-up by physicians was difficult to obtain, paper work was staggering, the cost per salvageable case found was high, and test quality control was frequently poor. As a result government supported budgets were reduced and popularity faded.

In the late 1950's the first automated method of the chemical analysis of blood serum was placed on

the market (sequential multiple analyzer). During the following ten year period this instrument and other new automated equipment, together with the use of Electronic Data Processing (EDP), provided an opportunity to solve the problems associated with the early demonstration programs and professional interest in MHS was revived. This renewed interest, tempered by memories of earlier problems but encouraged by the need for improved health delivery services, has been applied in a more cautious and limited manner. Through a systems design approach utilizing new instrumentation, a "third generation" of screening activity is now developing. This latest generation, known as Automated Multiphasic Health Testing (AMHT), combines automated equipment and computer technology with clinical tests and procedures to measure comprehensively a subject's physiological status (Medical and Pharmaceutical Information Bureau, 1970). AMHT is not primarily designed for the screening or diagnosis of disease, but is intended to accumulate as much data as possible about the total health profile of the patient and to aid the physician in the health management of his patient.

As a result of this evolution in the state-of-the-art, current health screening services vary from simple multiple screening to sophisticated, comprehensive, automated, computerized programs.

#### Current Status

Probably the most sophisticated and certainly the most experienced AMHT facility is located at the Permanente Foundation Multiphasic Health Screening Clinic in California (Collen, 1964). The Permanente Clinic is associated with the Kaiser Foundation health plan, a prepaid comprehensive medical care and health program which provides hospital and medical services to members on the West Coast and in Hawaii. AMHT laboratories are operating in the Kaiser-Permanente Medical Centers in Oakland and San Francisco, where approximately 60,000 patients are screened annually.\*

Several group practices, medical centers and hospitals are also either now operating, developing or planning automated or semi-automated multiphasic screening services (examples—Straub Clinic, Honolulu; Palto Alto Medical Clinic, Palto Alto; and, George Washington University Medical Center, Washington).

The U. S. Public Health Service has contracted for the operation of four demonstration programs utilizing automated or semi-automated equipment to make health assessments of adult populations in dif-

ferent administrative and community settings. As a result of these contracts MHS programs are now being operated by Tulane University School of Medicine, Milwaukee City Health Department, Brookdale Hospital Center (Brooklyn, N. Y.), and Rhode Island Hospital (Providence, R. I.).

The Division of Regional Medical Programs is also funding a series of pilot projects in which various configurations of MHS test batteries and associated programs are being examined (examples—Meharry Medical College, Nashville and the University of Rochester, Rochester).

General medical examination visits recorded by the National Disease and Therapeutic Index presently stand at 33.5 million annually (roughly 10 visits/50,000 population). This represents a 75 percent increase since 1962. Private business interests which have attempted to analyze the "market" predict that a minimum of 60 million multiphasic health screening examinations (replacing and/or supplementing PHE) will be performed annually by 1980.

For the past two years the sales growth of companies producing automated screening instrumentation hardware has been paralleled by the rate of organization of new companies proposing to market multiphasic screening system packages or services of various designs. A current count will reveal more than 20 recently organized commercial ventures which are involved in MHS activities. Industrial medical programs, hospitals, group practices, insurance companies, labor unions and private venture organizations are either being approached or are seeking to enter the field. Standard and Poor's is quoted in a recent Postgraduate Medicine investment commentary which states that medical electronic sales should approach the billion dollar mark in the coming decade with 350 million dollars paid for such equipment in the U. S. in 1969. A substantial portion of this market is related to test instruments and systems packages.

The Council on Medical Service of the American Medical Association developed recommendations on MHS which were adopted by the AMA House of Delegates at the 1968 annual convention. The recommendations call for further study of MHS to determine its role in the area of health maintenance and preventive medicine. The local medical profession is encouraged to seek active involvement in the planning and operation of MHS programs.

An Intersociety Committee on Multiphasic Health Screening has been formed by representatives of the American Academy of General Practice, the American Association of Ophthalmology, the American College of Radiology, the American Society of Internal Medicine and the College of American Pathologists. The committee membership also includes representatives from four other specialties involved in the various modalities tested in present MHS programs

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\* See also One Industry's Involvement in Health Care by Edgar F. Kaiser, pp 114-118.

## MULTIPHASIC HEALTH SCREENING

—the American Academy of Pediatrics; the American College of Obstetricians and Gynecologists; the American Laryngological, Rhinological, and Otological Society; and the American Medical Association. This committee is concerned with testing techniques and their application through pilot projects under a variety of sponsors in different settings.

On January 15, 1969, Senator Harrison A. Williams, Jr., Chairman of the Senate Special Committee on Aging, reintroduced “. . . a bill to establish health screening programs in a limited number of regional and community centers equipped with the latest in instrumentation and communication systems. The service would be free and voluntary for persons of age 50 or over, and it could become the cornerstone for a genuine national effort to prevent or reduce chronic disease by detecting it in its early stages.” (US Congress, 1969).

The selected examples listed above do not cover the entire field but they are representative of a rapidly expanding new health service and a new interest in early disease detection and preventive medicine.

### Typical MHS Program

Although the screening test procedures and utilization of electronic data processing varies in the different screening facilities currently in operation, the basic batteries of screening tests are similar. A typical multiphasic health screening test battery consists of: medical history, anthropometry, visual acuity, spirometry, tonometry, audiometry, chest x-ray, electrocardiography, blood pressure, cytology (for cervical cancer), basic blood serum chemistry (glucose, cholesterol, etc.), simple hematologic tests (blood cell count, hematocrit, hemoglobin), and urinalysis.

In the more sophisticated MHS centers mammography, thermography, retinography, sigmoidoscopy, Pan-O-Rex (dental x-ray) or other tests are sometimes included.

The MHS centers currently operating depend primarily on non-professional technical personnel to perform the various tests. Automated and semiautomated instrumentation is generally in use. The degree to which “on-line” computer operations have been effected varies considerably but apparently the majority of currently operating facilities use the “batch” method of electronic data processing which is provided by a dedicated computer or through time-sharing service arrangements. The computer “write-out” is a simple one page summary in some instances while in others it may be a multiple page narrative. Usually the “write-out” report is forwarded to a physician named by the patient.

Most facilities are designed to process a large volume of patients since the cost per test unit is extremely sensitive to volume. The patient sources

and referral mechanisms vary widely. Patients may be limited to eligible members of a labor union, a prepayment group, employees of a specific industry, physician referrals, self-referrals or mixtures of these.

### Pro and Con

MHS proponents claim that obtaining health data through the use of automated equipment operated by auxiliary and technical personnel can reduce the amount of time spent by the physician to approximately one-third of that spent in performing a PHE in the traditional manner and that the physician is provided with much more information on the patient. On the other hand, some physicians express the fear that the presumptive identification of disease through MHS with the consequent necessity for review of extensive health data and follow-up diagnostic study will in the long run require more of the time of already overburdened physicians.

Those who have had direct experience in the operation of MHS programs believe that the use of automated equipment reduces human error and provides better quality control. Other physicians who have been involved in the follow-up activities resulting from MHS point out specific instances of false negative, false positive or border line test results and emphasize the patient management problems associated with such occurrences.

Individuals who have utilized MHS services and those who promote its use proclaim that since there is no waiting and all tests and examinations are specifically organized and performed “under one roof,” the system is more convenient for the patient than the existing process of obtaining similar services through physicians’ offices, clinics and hospitals. Those who feel that screenees would find automated “assembly line” examinations unpalatable raise the specter of depersonalization and restriction of the sacred patient-physician relationship.

The charge to the patient served through current MHS facilities is approximately one-fourth to one-third that which he would have to pay for similar services obtained in the traditional manner. There has been no overt opposition to this fact *per se*. Instead, financially interested individuals and groups have responded either by attempting to block MHS proposals with other objections related in degree and nature to their vested interests, or by actively supporting applications of MHS through personal investments of time or dollars. In both instances the real or fancied financial threat of MHS to certain physicians, and the opportunity to others for financial gain through investments, is mute or camouflaged.

Both the proponents and opponents agree basically that final scientific research has not yet been performed to establish proof that MHS actually leads

## R. W. JESSEE

to improved health or a saving of lives. The former group believes that this information can only be obtained through expanded and continuing experience with MHS while the latter uses the lack of proof as an argument against further expansion and experience. A comparable basic agreement and divergence of attitudes prevails in regard to the cost-yield factor of MHS, but generalization in this area is not logical since the cost-yield ratio must be related to a specific objective.

### Summary

Early disease detection methods, primarily the Periodical Health Examination and Multiphasic Health Screening, have evolved along with the contemporary philosophical and technological developments of this century. The current availability of automated testing equipment combined with electronic data processing has created a new potential for the economical application of multiple health testing procedures to large numbers of persons. Interest in exercising this potential is expressed by group practice organizations, prepayment health care programs, the Federal government, organized medicine and various commercial enterprises.

The typical Multiphasic Health Screening program supplements the physician's armamentaria by combining a battery of accepted health testing procedures, performed by technical personnel utilizing automated equipment and electronic data processing, to accumulate data reflecting the physiological status of the patient.

When the details of screening programs are discussed by members of the health profession, there is an equivocal tendency which is usually replaced by a consensus that the use of automation, computers and technical personnel will be involved in the future delivery of health care services. It is also generally agreed that the problem to be resolved is not whether the technical and operational capabilities of such services are feasible; but rather, how to integrate the application of the new technology into the existing health care complex to the benefit of the patient, the community and the health profession.

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