

TRANSFORMING PRIMARY CARE:
How Multiphasic Health Services Redefined Care Delivery at
Kaiser Permanente, 1948-1973

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List of Abbreviations

AMA: American Medical Association

HIF: Health Information Foundation

ILWU: International Longshore and Warehouse Union

MMR: Department of Medical Methods Research (now known as the Division of Research)

MCDS: Medical Care Delivery System

MHTS: Multiphasic Health Testing Services (normally followed by a physician exam)

MHTS-RN: Multiphasic Health Testing Services with a Nurse Practitioner Exam

MHC: Multiphasic Health Checkup

PCMH: Patient-Centered Medical Home

PHS: U.S. Public Health Service

PMG: Permanente Medical Group

TMC/TMS: Traditional Medical Care/Traditional Medical System

Introduction:

On November 20, 1951, Dr. Morris Collen, the medical director at Kaiser Permanente's Oakland Medical Center, did something outrageous. He conducted a checkup on a perfectly healthy patient. Such annual examinations are now staples of American healthcare. At that moment, however, Collen challenged deeply-rooted mentalities about the doctor-patient relationship. Americans in the mid-twentieth century envisioned the physician as a medical guardian and independent entrepreneur. Physicians in turn saw themselves as healers of illness, to be consulted only when patients were ill. And when illness struck, they expected to be justly compensated for their services. Collen was not the prototypical 1950s doctor: he belonged to Kaiser Permanente, a pre-paid group practice; he was focused on detecting diseases before they debilitated his patients; and most interestingly, he had started to employ a novel screening approach known as multiphasic health testing, which aimed to restructure doctors' responsibilities by shifting some primary care tasks to nurse practitioners and paramedical personnel, while still optimizing patient care.

A young physician fresh from residency, Collen joined Kaiser Permanente during World War II, when Kaiser was at the forefront of healthcare reform.¹ In 1941, the Permanente Health Plan had begun providing wartime medical care to industrialist Henry Kaiser's shipyard employees.^{2,3} The model -- a prepaid scheme with a physician group practice -- proved to be successful and scalable by the end of the war. Encouraged by these early healthcare ventures, Kaiser and his medical director, Sidney Garfield, introduced a version of this health plan to the public in 1945.⁴ Almost immediately, dominant healthcare actors of the mid-twentieth century -- independent physicians, Blue Cross/Blue Shield, and commercial insurance companies -- harshly criticized the Permanente Health Plan. Additionally, price wars and lawsuits faced by Kaiser

Permanente meant that it and its physician body, the Permanente Medical Group, had to innovate to effectively compete in the brutal healthcare market of the 1950s.⁵ Key to this innovation strategy was the 1951 introduction of multiphasic health screenings in Kaiser's Oakland and San Francisco medical centers.⁶

Multiphasic health screenings were a new approach to care delivery and consisted of conducting a battery of assembly-line screening tests before a patient ever saw a physician. These screenings were originally designed as a competitive measure to provide wellness checkups (Blue Cross and other insurers did not cover such expenses at the time).⁷ However, as Collen and others saw these screenings' potential to streamline clinic workflows and reduce cost, they became central to improving practice at Kaiser's medical facilities. Over time, Kaiser Permanente integrated multiphasic health testing into its normal clinical workflow and incorporated technological advances to improve accuracy and efficiency.⁸ These systems also generated a considerable amount of data that fueled epidemiological studies at Kaiser.⁹ By the mid-1970s, multiphasic health testing services had fundamentally transformed Kaiser's approach to service delivery; unlike traditional healthcare actors, Kaiser's medical facilities emphasized early disease detection and worked to maintain the total health of its subscribers over an extended period of time.¹⁰

This paper will present four main arguments to show how multiphasic health programs transformed Kaiser Permanente into an alternative healthcare plan and how the use of these programs revolutionized primary care between 1948 and 1973. First, I propose an explanation for how and why multiphasic health programs emerged specifically at Kaiser Permanente. This narrative begins in 1948, when U.S. Public Health Service (PHS) officials expanded the scope of conventional disease campaigns and launched the first multiphasic health programs in San Jose,

California, which proved successful.¹¹ Building on the promising findings of this study, Kaiser Permanente began testing this approach in its own medical centers beginning in 1951. Under the direction of Morris Collen, multiphasic health testing benefited from an unprecedentedly close collaboration with PHS and became the cornerstone of Kaiser's innovation for almost three decades. I analyze multiphasic health screenings in the context of Kaiser's overall growth and its early efforts to collect and analyze data.¹² From there, I focus on the key actors involved in this process and the various planning efforts that institutionalized multiphasic health screenings. During this period of heightened innovation, Kaiser expanded multiphasic health centers across its facilities in Washington, California, and Hawaii.¹³ It also rigorously developed workflows for multiphasic health screenings and evaluated these processes in many academic publications. This narrative of innovation ends during the 1973 recession. That year, Kaiser lost its research funding from PHS and terminated its pioneering research in medical computing.¹⁴

Second, I argue that the success of multiphasic health screenings at Kaiser Permanente introduced a new ideology, one of conducting health services research and directly applying those results to improve practice. The idea that one had to engage in research to improve practice was revolutionary in the 1950s medical community; since the early 1800s, private physicians and insurance plans had instead actively sought to separate public health from medical care.¹⁵ But Kaiser readily took up this approach in its operations, allowing it to optimize patient outcomes and streamline clinic workflows. I also explain how its administrative structure facilitated the application of research to practice: under the supervision of its Department of Medical Methods Research (MMR), the Permanente Health Plan designed and implemented several multiphasic health screening pilot programs. Technological advances in the 1960s also improved the sensitivity and accuracy of screening tests, allowing Collen and his associates to collect vast

amounts of data on their patients.¹⁶ Collen's team analyzed these results and used the database to not only practice *more*, but also practice *differently*. This research-to-practice ideology developed early in Kaiser's history and fueled the expansion of multiphasic health testing services throughout its health facilities.¹⁷

Third, I contend that multiphasic health testing services spread beyond Kaiser's own operations influencing industry, national, and international medical practices. Beginning in the late 1960s, the popularization of multiphasic health screening programs in academic and industry journals, as well as coverage in news articles, bolstered the legitimacy and potential of preventative medicine. I provide examples of various collaborations and symposiums that brought together private industries, engineers, and group practices to explore the full potential of technology in healthcare.¹⁸ In the national sphere, Kaiser worked with government to address persistent gaps in Medicare and Medicaid. As Senator Harrison A. Williams noted in the mid-1960s, "Medicare doesn't do a blessed thing to prevent disease. It merely helps us cope with the damage caused by disease."¹⁹ And in the international sphere, I address the impact of Kaiser's multiphasic health testing programs on international primary care practices and detail the proliferation of multiphasic health testing facilities around the world: by 1975, there were roughly 325 multiphasic health testing facilities in the United States, 40 in Japan, 30 in Europe, and a few scattered across Australia, Asia, Canada, and Latin America.²⁰

Lastly, I argue that Kaiser Permanente permanently transformed the role of the physician in healthcare by introducing multiphasic health testing in clinical settings. The Permanente Health Plan had comprehensive services and group practice, and it used these advantages to unite public health research and physician care delivery. Indeed, providing multiphasic health testing services was an early case of collaboration between PHS and physicians; before then, physicians

commonly felt that public health initiatives were intruding on their practice or stealing away their patients.²¹ Multiphasic health testing programs bridged longstanding barriers between public health and medicine and encouraged physicians to care for patients outside of the clinical domain. I trace this progression, describing the gradual implementation of the Medical Care Delivery System framework, which combined multiphasic health testing with efforts to promote diet, exercise, and counseling outside of Kaiser's medical centers.

Early Beginnings: The Rise of Kaiser Permanente in the 1950s

The managed care organization now known as Kaiser Permanente grew out of wartime necessity for medical care at industrialist Henry Kaiser's shipbuilding yards in California, Oregon, and Washington. Born in upstate New York, Kaiser had moved west when he was 24. Although he never finished formal schooling, he excelled at identifying opportunities to capitalize on regional natural resource industries, according to historian Rickey Hendricks.²² Some of Kaiser's first business ventures involved winning contracts to build city streets and irrigation projects for sparsely populated regions of the West Coast. By 1931, his construction company had united with several others to compete for New Deal reclamation contracts. The consortium successfully completed a \$48.9 million contract to build the Hoover Dam, and in 1938, Kaiser's company won the rights to the second phase of a contract to build the Grand Coulee Dam in eastern Washington.²³ Kaiser's company not only inherited construction responsibilities from the initial builders, but also an ongoing conflict with labor unions complaining of poor working conditions.

Around the same time, a young doctor named Sidney Garfield was slowly gaining a reputation as both an excellent physician and healthcare planner. Garfield had earned his medical degree at the University of Iowa in 1928, and returned home to Los Angeles shortly after for a

residency at the Los Angeles County Hospital.²⁴ Faced with precarious job prospects, he entered contract practice with an insurance consortium providing care to workers building the Los Angeles Aqueduct.²⁵ Garfield based his practice in a small desert town called Desert Center, and invested his own money into building a twelve-bed hospital. Debts accumulated quickly. The hospital struggled to remain financially solvent as workers paid only a minimal sum towards compensation insurance. His practice on the verge of collapse, Garfield began to experiment with new payment schemes. Between 1933 and 1934, he convinced the majority of workers to pay a supplemental five cents as prepayment for services to avoid increased costs of care when they were injured. He also convinced employers to pay him fixed sums independent of workers' compensation insurance.²⁶ Garfield quickly added group practice to his prepayment scheme, and in 1935, was successfully operating three hospitals with a team of physicians.

When Kaiser's older son, Edgar, came to manage the Grand Coulee Dam construction in March 1938, he moved quickly to negotiate better working conditions with disgruntled unions. Edgar Kaiser had heard of Garfield's work, and in an attempt to appease union calls for better healthcare, invited the physician to visit Grand Coulee's site and form a medical partnership.²⁷ Initially hesitant to engage in yet another contract position, Garfield changed his mind upon realizing that Grand Coulee offered advantages over the sprawling Los Angeles aqueduct. Workers were centrally located, making it an ideal location to test prepaid group practice.^{28,29} Over the next year, Garfield oversaw the reconstruction of the decrepit Mason City Hospital, recruited new physicians, and devised a voluntary prepaid scheme funded by a fifty cent weekly deduction from workers' payroll, and a workers' compensation premium from an insurance company. Grand Coulee was Garfield's first foray into prepaid group practice.³⁰

He soon had the chance to scale his efforts when Henry Kaiser won wartime shipbuilding contracts in 1939 and asked Garfield to continue providing comprehensive health services.³¹ As the Second World War escalated, Kaiser's shipyards in Richmond, California expanded to include additional building yards in Fontana, California and the Portland-Vancouver area.³² Garfield initially focused his medical plan on the Richmond labor force because workers migrated to the area in large numbers. Roughly 221,600 new workers entered Richmond's shipbuilding yards beginning in 1943. To provide adequate care to laborers, Garfield negotiated contracts with union-approved insurance companies. He met the costs of constructing new hospitals using 17.5 percent of insurance premium payments supplemented by weekly, fifty-cent payroll deductions. By the time the shipyards closed in 1945, Garfield and Kaiser had established two Permanente Foundations to run medical programs for almost 200,000 people, and had successfully financed four hospitals.³³

Within a month of Germany's surrender, membership in the Health Plan had dwindled to 17,000 subscribers. Believing he could reorganize his wartime health plan to make healthcare more accessible, Kaiser publically launched the Permanente Health Plan in July 1945, with Garfield as medical director and Kaiser as a trustee.³⁴ Until 1950, most enrollment was on an individual, self-paying basis, which dissuaded union workers and their families from signing up. This changed when Garfield convinced the International Longshore and Warehouse Union (ILWU), amongst other regional unions, to sign large-scale contracts. With West Coast unions encouraging mass enrollment of workers, public membership swelled beyond Kaiser's wartime production embryos in northern California, Portland-Vancouver, and southern California.³⁵

Growth of membership in the Permanente Health Plan spurred expansion of its parent institution.³⁶ A California Medical Association report indicated that by February 1953, the

Permanente system consisted of four inter-related organizations: a charitable governing trust known as the Permanente Foundation, run by a board of trustees (including Kaiser); the Permanente Health Plan; a non-profit corporation responsible for developing Permanente Hospitals; and the physicians' group practice called the Permanente Medical Group (PMG). "These closely knit enterprises are unique in the application... of two mass production concepts," the report noted. "(1) Assurance of the large clientele or "market" through prepayment.... And (2) utilization of surplus funds for expansion and even more expansion." As the plan continued to grow, formalized structures were comfortably in place to meet the needs of enrollees, the report suggested.³⁷

The expansionary desire expressed in this report is exactly what threatened America's 1950s healthcare establishment. Just as the Permanente Foundation was seeking to expand its operations, companies offering other forms of healthcare coverage—service benefit plans and commercial indemnity plans—were also growing.³⁸ As historian Beatrix Hoffman argues, however, these schemes were largely limited to hospital coverage.³⁹ Commercial indemnity plans required patients to pay hospitals upfront and solicit reimbursements from their insurance. Service benefit plans like Blue Cross, on the other hand, allowed patients to pre-pay a set sum and have hospitals directly bill the insurance.⁴⁰ Nevertheless, both plans proved popular. By 1953, commercial indemnity plans and Blue Cross covered 29 percent and 27 percent of Americans respectively.⁴¹ Despite their dramatic rise, healthcare conglomerates paradoxically paved the way for government intervention by excluding large segments of the population (e.g. the elderly or Americans with pre-existing conditions), according to historical sociologist Paul Starr.⁴² By 1950, only 51 percent of the population was covered for some kind of hospital benefits, 36 percent for surgical benefits, and 14 percent for in-hospital medical benefits.⁴³ Even

those who received hospital coverage still had to pay out of pocket for doctors' visits, drugs, screenings, lab tests, and chronic care.⁴⁴ Alongside rapid technological and research advances in healthcare, the expansion of indemnity and service-benefit plans dramatically increased the total national expenditure on health services from \$4 billion in 1940 to \$18 billion in 1955.⁴⁵

Comprehensive coverage primarily appealed to America's growing working class, and by 1953, Kaiser Permanente's membership had increased more than tenfold to cover roughly 288,000 individuals.^{46,47} Kaiser and his associates were not the first to attempt prepaid group practice, but they were the most successful (largely due to strong union ties).⁴⁸ The same California Medical Association report that had outlined Kaiser Permanente's structure also provided insight into what made the plan so popular. Unlike traditional health insurance plans, Kaiser's plan offered comprehensive coverage. "For monthly charges ranging from \$3.25 to \$6.95," the plan offered "medical and surgical care by Permanente physicians, hospital care in Permanente hospitals and drugs and medicine while hospitalized."⁴⁹ Other stipulations outlined fees for doctors' visits and adding dependents to subscribers' plans. Together, these payments financed the construction and operations of hospitals, clinics, research institutes, and rehabilitation centers.⁵⁰

Meanwhile, fee-for-service physicians and commercial insurers used a variety of strategies to attack Kaiser Permanente, ranging from reducing their own fees to filing lawsuits.⁵¹ However, as Paul Starr emphasizes, these attacks largely failed because Kaiser's prepaid group practice was heavily insulated from the pressure of private physicians. Kaiser built and maintained its own hospitals, and could develop incentives across its organization for physicians to cut down on costs.⁵² Furthermore, the AMA (which had supported previous attacks on group practice by private physicians) gradually toned down its vigilant opposition to prepaid group

practices, believing that they were few in number and heavily concentrated. This decision left the Permanente Health Plan free to compete in the booming healthcare landscape of the 1950s.⁵³

Creating Market Demand: Kaiser Permanente's Data-Driven Growth Strategies

From its initial public launch in 1945, the Kaiser Health Plan aimed to compete by optimizing its administrative procedures and methodically improving its quality of care. As early as 1944, Kaiser's archives indicate that the organization valued statistics and wanted to collect and analyze hospital data. The Permanente Foundation's "Annual Report on Research and Medical Care Programs" described plans for a statistical program that could facilitate administration and "provide basic material for statistical summaries for medical socio-economic studies, and medical research on specific diseases."⁵⁴ The following year, the annual report's major objectives also encapsulated cost analyses, focused on measuring the usage of health services and costs of providing care to different patient demographics.⁵⁵ These annual reports suggest that the Permanente Foundation intended to actually apply data collected from members to make economic and clinical improvements.

By the 1950s, the Permanente Foundation's Board of Trustees had begun to consider a variety of statistical programs. However, it had yet to formulate a clear sense of its aims. A document outlining internal recommendations for its Research Program merely highlighted the "unique opportunity for contribution to medicine and society as a whole by intensive and careful continuous examination of our experiences in medical care from an analytic and statistical viewpoint."⁵⁶ During the early 1950s, the Board reviewed a proposal from married couple John and Margaret West to revitalize Kaiser's statistical program, a project that never came to fruition. In a summary letter Margaret West sent to Henry Kaiser's adviser, Robert C. Elliot, she described her experiences as a PHS employee. As part of the Division of Public Health Methods,

she studied staffing structures in hospitals and evaluated disease-reporting measures by local health departments.⁵⁷ Little information exists on John West, though the Wests' 1953 correspondences with the Permanente Foundation indicate that he, too, was a statistician.⁵⁸ The Permanente Foundation reviewed various priorities for the statistical program that the Wests proposed, including analyses of why members left the Health Plan, which services members used most, how to appropriately staff health centers, and—perhaps most forward-thinking—how to go about creating optimal medical record systems.⁵⁹ The Wests' proposal was ambitious, and projected to cost roughly \$375,000 over a three-year period.⁶⁰ Thomas McCarthy, legal counsel to the foundation, strongly opposed the idea. “The Health Plan is not a charitable activity and a statistical study and analysis of its operations would ordinarily be a business activity,” he wrote in a letter to Robert C. Elliott on March 6, 1953. “The Foundation has not in the past been regularly engaged in supporting studies of this kind as educational projects.”⁶¹ While the Wests' proposal had outlined several goals, it failed to introduce an end product that could be considered “non-charitable.”⁶² Rather, as Henry Kaiser wrote in a letter to the Wests on April 23, 1953, the Trustees decided to turn statistical responsibilities over to medical economist Arthur Weissman, who joined the organization in June 1953.⁶³

Prior to joining Kaiser, Weissman was an employee of the State Department of Public Health. He proposed a number of statistical initiatives similar to the Wests' ideas, including endeavors to collect data on costs related to volume of services provided, physician availability and retention, quality of care, and any other information relevant to organizational development.^{64,65} It is unclear to what extent Weissman's proposals were put into effect, but the difficulty in executing both his and the Wests' propositions likely lay in the significant gap between healthcare administration and healthcare practice. All Kaiser Hospitals and medical

centers collected daily census information on patient volumes but little documentation exists on its practical uses.⁶⁶ Thus, while data was being captured daily, physicians rarely were involved in analyzing or applying relevant findings. Ironically, collecting daily census information without putting it into effect exemplified the “educational projects” Thomas McCarthy had criticized. The first long-term opportunity to integrate data collection and practice instead arose when Kaiser Permanente’s medical centers adopted multiphasic health screenings in the early 1950s.

Re-Imagining Public Health Screenings: The Birth of Multiphasic Health Pilots

Multiphasic health screenings built upon historical screening efforts by combining several individual screening tests in an assembly-line process. In many ways, this approach was a natural extension of vertical disease screening efforts PHS undertook in the early 1900s. The novelty of this system, however, lay in moving population health surveillance techniques into the physician’s domain. Until this point, public health concerns had largely been ignored by individual physicians. The history of disease reporting in the U.S. dates back to 1741, when colonial Rhode Island mandated tavern keepers to report infectious diseases like cholera, smallpox, and yellow fever to local officials.⁶⁷ Historian Amy Fairchild emphasizes the fact that early disease surveillance occurred in a preindustrial context. For many tavern keepers and artisans, their business and home life occupied the same space, and thus, disease reporting was seen as a communal effort in line with traditional Puritan values. While the United States underwent significant political transformations, Fairchild suggests that this “interdependence” lived on, and defined the U.S. Public Health Service’s (PHS) trajectory.⁶⁸

Founded as the Marine Hospital Service in 1798, PHS initially served to care for sick and disabled seamen. In the nineteenth century, its operations expanded to include quarantines, port closures, and food and drink inspections, but it continued to exist separately from

physician's private practice.⁶⁹ Public health and the medical establishment gradually developed a semipermeable barrier of sorts: physicians freely entered public health, but public health officials constantly had to make concessions. To ensure they remained the medical stewards of their patients, physicians actively opposed public health officials when they believed the state encroached upon their private practice.⁷⁰ Fairchild's analysis of 1911 New York City TB surveillance campaigns is telling. Physicians often refused to release the names of positive TB patients to public health officials, fearing they would lose these patients to the state.⁷¹

Nowhere was this skewed relationship more evident than in the implementation of periodic health examinations. Intended as a safety measure, these examinations initially targeted school children. In the mid-1800s, health inspectors routinely visited schools but were ordered to send sick children home rather than provide actual treatment. Commenting on the need for periodic exams in 1861, physician Horace Dobell outlined his philosophy in a series of lectures titled "On the Germs and Vestiges of Disease, and On the Prevention of the Invasion and Fatality of Disease by Periodical Examinations":

I wish, then, to propose...a system of periodical examination, to which all persons should submit their children. Such an examination must include an inquiry into the family history... into the personal history...and, after due consideration, such advice must be given...with a view to correcting any defects or tendency to defects in the organism.⁷²

Health examinations gradually became more popular in the late 1800s, and many corporations often required health examinations before hiring new employees. Simultaneously, Paul Starr argues that, "public health sponsorship of preventive medical examinations was, in effect, unpaid advertising for the medical profession."⁷³ Public health auspices administered diagnostic and educational services, but treatment was strictly left to private practitioners. The AMA and its physician associates could thus minimally contribute to marketing periodic health examinations, but benefit greatly from PHS' disease campaigns.⁷⁴ Another limiting factor in

developing effective health examinations was their selective usage. Screenings were often confined to specific groups thought to be high-risk populations. Immigrants to the United States, for example, underwent thorough screenings for communicable diseases before the 1900s. Army officers were also ordered to undergo routine physical testing beginning in 1908.⁷⁵ Despite lacking support from the medical establishment, by the 1930s, PHS had designed simple mass screening techniques for TB, syphilis, diabetes, and heart disease that generated reasonably accurate results. Nevertheless, screening efforts remained vertical disease campaigns, rather than packages of multiple tests in one sitting.^{76,77}

Lester Breslow, a PHS physician interested in chronic disease epidemiology, first proposed combining various screening efforts under the label “multiphasic screening” in 1948.⁷⁸ A former classmate of Dr. Morris Collen at the University of Minnesota, he held prominent positions as a public health official over the course of his career.⁷⁹ Early in his career, Breslow was interested in making screenings more efficient by introducing a battery of synchronized tests.⁸⁰ In 1949, as Director of the California State Department of Public Health, Breslow launched a multiphasic survey of 945 employees in four of San Jose’s industrial establishments. These employers viewed screenings as favorable to employee health, and thus permitted Breslow’s study. Supported by Santa Clara’s County Medical Society and San Jose’s public health department, Breslow organized teams of physicians, nurses, and laboratory personnel to visit industrial plants. Participants moved through five procedures: a brief history, blood and urine draws, a chest X-ray, and urinalysis. At the end, the medical team reviewed patient screenings and compared them to normal cut-offs for measures like blood sugar. If participants exceeded any threshold criteria, the team referred them to physicians for follow-up care. These physicians were tasked with reporting back to the County Medical Society.⁸¹

Breslow and his colleagues published their findings in *California Medicine* in 1949, with a specific interest in documenting positive cases of disease previously unknown to patients. Out of 945 participants, thirteen cases of previously unidentified disease and sixteen cases of known disease were referred and linked into medical care.⁸² Of equal significance, however, was the assembly-line process developed to expedite individual screens. “The assembly-line approach to taking these specimens for examination made the absence of an employee from work a relatively small item,” co-author Dr. Dwight M. Bissell wrote in a follow-up commentary to the publication. From the time an employee left his desk for screenings to when he returned, Bissell noted that roughly only “a half-hour had elapsed.”⁸³

Amidst rising costs of healthcare delivery and coverage, many healthcare practitioners found multiphasic screenings’ potential to improve efficiency highly appealing.^{84, 85} In the aftermath of the San Jose survey, multiphasic health programs blossomed. The Council of the Massachusetts Medical Society approved five pilot multiphasic clinics in 1949, and the executive director of the American Hospital Association, George Bugbee, suggested that hospitals include multiphasic screening clinics as part of their services. Many, like Morris Collen, embraced the potential for multiphasic health screenings.⁸⁶ But criticisms emerged early on.⁸⁷

Among the program’s chief critics was Dr. Joseph Mountin, who was Assistant Surgeon General in 1950. Though interested in chronic disease management, he was alarmed by the growing demand for multiphasic screenings. Existing healthcare infrastructure, Mountin believed, had not developed appropriate follow-up processes for diagnosis and treatment. He also worried about the appropriate selection of screening tests. How were public health officials to decide on which screening tests to include? And how would multiphasic screenings set cut-off values for measures like blood pressure or blood sugar so that physicians would no deal with

excessive referrals? These concerns highlighted the need for accurate and sensitive screening tests, but did not discourage the replication of multiphasic health programs.⁸⁸

Kaiser Permanente and the Growth of Manual Multiphasic Health Screenings:

At the same time that multiphasic health screenings were being hailed as a focal point in preventive medicine, fee-for-service advocates actively opposed alternative medical organizations. Following the defeat of President Truman's national health insurance proposals in the late 1940s, the healthcare market was dominated by the nonprofit Blue Cross and for-profit private health insurance schemes.⁸⁹ According to Hoffman, "Private health insurance was not just an alternative to national, compulsory insurance, but also a way of preventing such a system from becoming possible."⁹⁰ By instituting co-payments, deductibles, and pre-existing condition clauses, insurers left a significant gap between public expectation of healthcare and the limited services actually offered. Through the late 1940s and mid-1950s, labor and consumer groups pushed for more comprehensive coverage and encouraged their members to subscribe to group practices. Insurance leaders opposed comprehensive coverage because they felt it would be too expensive and violated their belief that insurance existed for unexpected events.⁹¹ Beginning in 1953, the Health Information Foundation (HIF), an active opponent of "socialized medicine," brought together officials from Blue Cross, commercial insurance plans, and the AMA for meetings to discuss the threat of comprehensive coverage. If companies offered to cover "every damn thing under the sun," in HIF President Admiral Blandy's words, they would encourage patients to overuse healthcare services.⁹² The following year, independent physicians responded to these meetings by aggressively mounting lawsuits against group practices, and marketing new service-benefit plans with reduced fees.^{93,94}

Even when 1950s health insurers marketed reduced fees, they actually encouraged healthcare spending. Hoffman specifically cites Blue Cross' acceptance of healthcare providers' inflated charges and preference for hospital over clinic utilization as major drivers of rate hikes in the 1950s.⁹⁵ Kaiser Permanente entered this market of escalating healthcare costs with a very different approach to care. From its inception, the Permanente Health Plan had two goals: to provide quality, affordable healthcare to middle-income consumers; and to prove that the Permanente Health Plan was a viable alternative to the entrenched medical establishment. The delicate tension between these two very different philosophies on healthcare coverage influenced many of Kaiser Permanente's major initiatives during the decade, especially its decision to pursue multiphasic health screenings in 1951.⁹⁶

Dr. Morris Collen, then serving as Chief of Medicine in Kaiser Permanente's Oakland Medical Center, led the multiphasic health program. As an undergraduate at the University of Minnesota, Collen studied electrical engineering and wanted to pursue a research career in electro-organic chemistry. While he subsequently decided to enroll at the University of Minnesota's medical school (alongside classmate and future colleague Lester Breslow), his passion for research fundamentally shaped his medical career.⁹⁷ During his medical residency at the Los Angeles County Hospital, Collen was supervised by Sidney Garfield, then the hospital's senior resident. A strong bond of mutual respect quickly formed between the two men, and when Garfield was recruited to work for Kaiser, he asked his former medical colleagues like Collen, Dr. Raymond Kay, and Dr. Cecil Cutting to join him. These early interactions gave Collen a link to Kaiser Permanente, and created a network of contacts that he later pulled on to implement the Permanente multiphasic health screening program.^{98,99}

In a 1986 interview, Collen recalled Sidney Garfield's mandate to provide checkups to all patients as part of Kaiser's comprehensive coverage plan. "Blue Cross/Blue Shield, with which we competed, did not provide health checkups....In our case, however, we had to provide health checkups to essentially well people, or people who just wanted to be reassured that they weren't sick."¹⁰⁰ Collen needed at least three or four additional physicians merely to conduct checkups. When he petitioned Garfield for more physicians, Garfield told him the organization lacked funding to support additional staff. Instead, Collen recalled Garfield reminding him that "Dr. Lester Breslow, who then was chief of the California State Department of Health, had... published an article on multiphasic screening."¹⁰¹ Drawing on the former classmates' past relationship, Collen approached Breslow in early 1951 to explore adopting a multiphasic screening approach at Kaiser. Breslow suggested that PHS and Kaiser collaborate in launching multiphasic screening surveys for the ILWU, which had recently signed a large union contract with Kaiser Permanente.^{102,103}

Between June 18 and November 30, 1951, 3,994 men underwent a twelve-test screening sequence on the second floor of the ILWU hiring hall on the San Francisco waterfront. Kaiser Permanente provided testing equipment and personnel. The program took place outside of a clinical setting, but nevertheless prepared Collen to think about designing appropriate record systems and optimizing screening assembly lines.¹⁰⁴ Of the 3,994 men tested, 2,521 had one or more positive screening tests, with 1,087 new diagnoses established (Figure 1).¹⁰⁵ Men with positive test results (e.g. diabetes or hypertension) were referred to the nearest Permanente center for further laboratory tests and physician follow-ups.^{106,107} Kaiser would come to expand such services to all of its medical centers, but this early partnership between PHS and a consumer health plan fundamentally challenged notions of how health services should be planned and

administered. Collaboration between the two entities defied the medical establishment's clear separation of medicine and public health. It was also an early instance of doctors working to *prevent* disease, rather than simply *curing* patients when they ultimately required care.¹⁰⁸

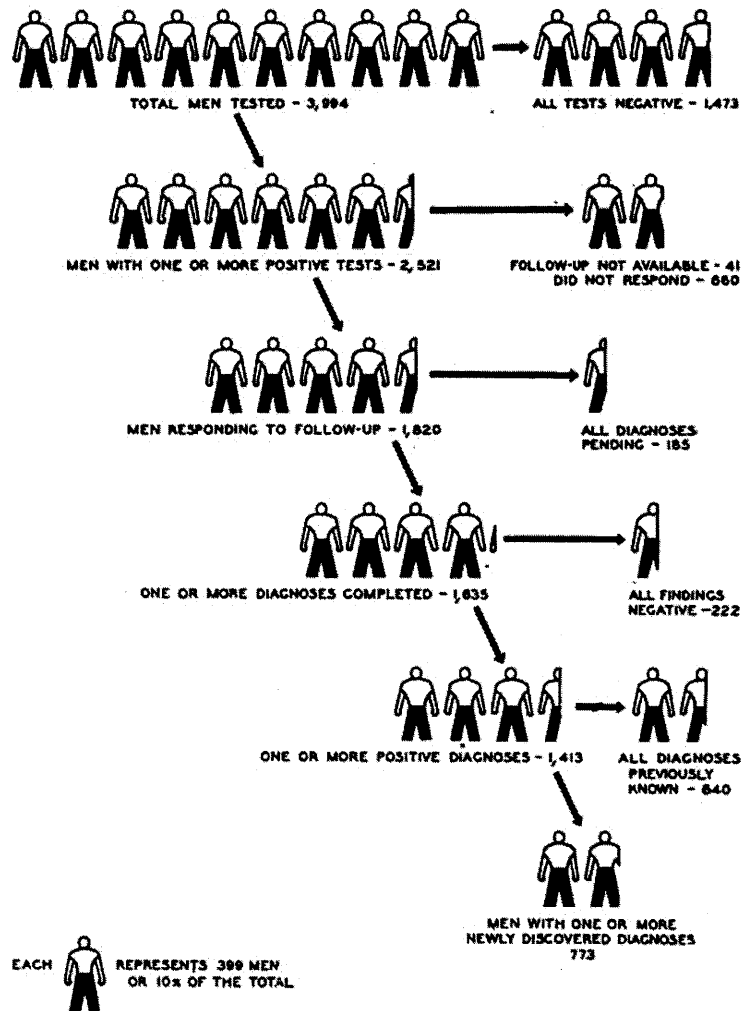


Figure 1: A diagram depicting the results of diagnostic follow-ups in Breslow and Collen's initial ILWU multiphasic health screening pilot from June 18, 1951 to November 30, 1951. Each level in the diagram above represents a step towards newly discovered diagnoses. The left column represents total men at each level, and the right column represents diagnostic or follow-up failures that hindered results. Following this sequential process helped Breslow and Collen realize the value of multiphasic health screenings in discovering previously unknown disease diagnoses within a population.

Courtesy of Weinerman et al., "Multiphasic Screening of Longshoremen with Organized Medical Follow-Up," 1559.

The early success of the Longshoremen contracts was encouraging, and suggested that Kaiser could expand its preventative health measures at low cost. On November 20, 1951, PMG's Executive Committee approved a permanent multiphasic center under Collen's direction at the Oakland Medical Center.¹⁰⁹ From its inception, the program claimed a unique space for itself as an extension of the center's normal operating hours. Collen recalled:

After the clinic closed at 5:30, we used the existing office space in the surgery clinic. We developed a whole series of arrows and put colored tapes on the floors so that patients would go in through the various rooms and have their height, weight, blood pressure, and other physiological measures taken, then fill out a history form. Then they would be directed to the laboratory for blood and urine tests, to the x-ray department for a chest x-ray, and to the electrocardiography department for an electrocardiogram.¹¹⁰

Collen and Garfield had succeeded in offering a new service without additional equipment or facility space, but maintaining the program's competitive edge would require careful workflow design and integration into the clinic. Multiphasic health centers were primarily divided into two workflows, sequential and carrel testing, each with benefits and drawbacks. The early multiphasic programs of the 1950s used sequential testing, in which patients traveled from one testing station to the next. Sequential testing could process large volumes of patients with the best cost-effectiveness, but surges in patient flow sometimes caused queuing between stations.^{111,112} Based on his experience with early multiphasic programs, Sidney Garfield created a floor plan of the sequential Oakland Medical Center as it was in 1978 (Figure 2).¹¹³ Carrel testing, on the other hand, emerged in the 1970s and combined a group of tests in one room staffed by one technician. The technique was useful for smaller clinics, and allowed for more flexibility and customized care; at the same time, it was costly, required duplicate equipment, and could not process large volumes of patients. Kaiser Permanente experimented with both models of testing, as well as hybrids of the two.¹¹⁴

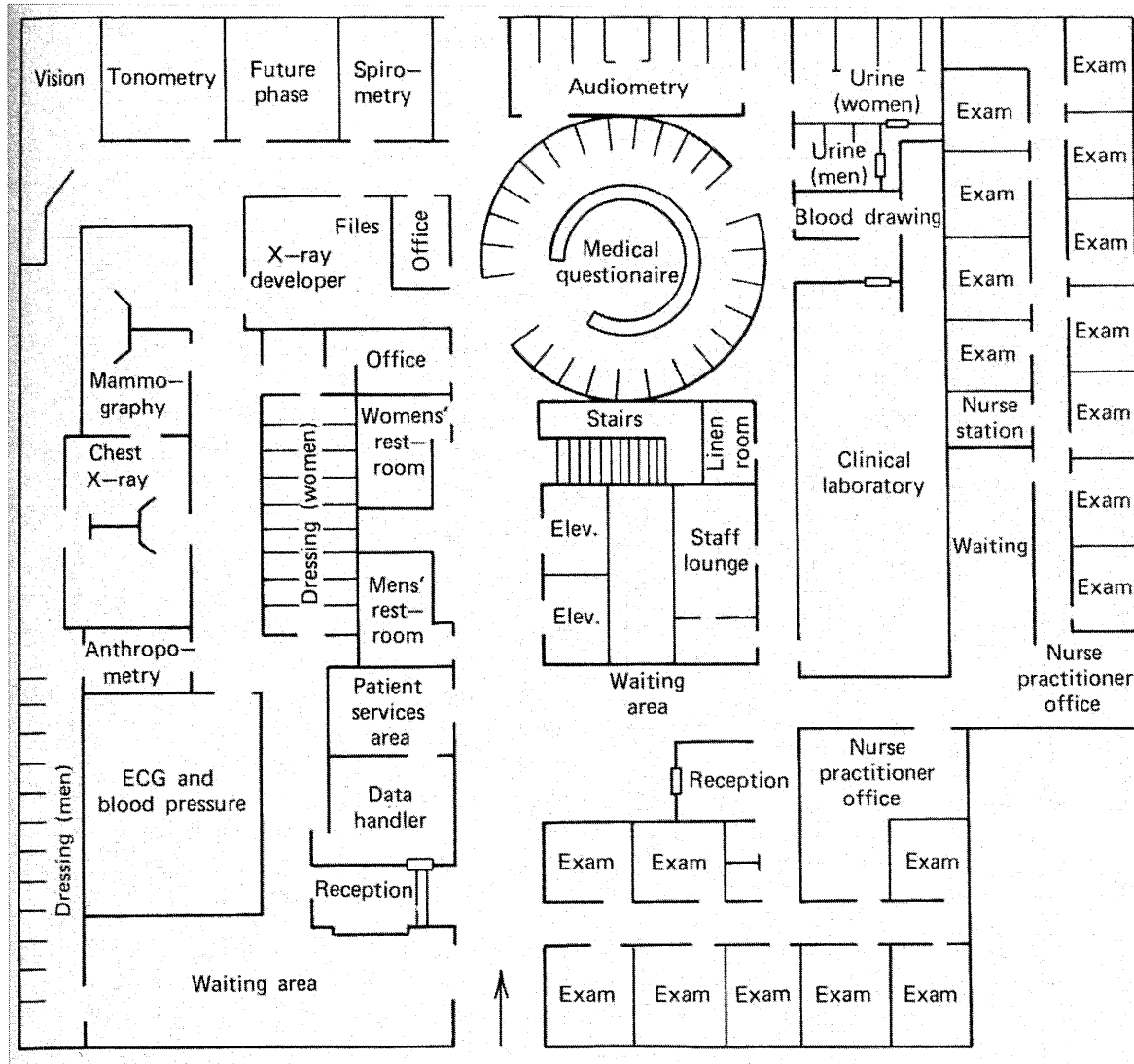


Figure 2: Sidney Garfield's rendition of the Oakland Medical Center's MHTS facility in 1978. The center employed a sequential workflow, meaning that patients moved from station to station to receive different tests. The arrow at the bottom of this picture represents where patients entered and first met reception. They then proceeded through various stations for "Chest X-Rays," "ECG and Blood Pressure," and "Vision", among others. Before leaving, patients received a health exam by a nurse-practitioner in the exam rooms on the right and bottom perimeters of this floor plan. Figure 4 on Page 34 of this paper depicts the full sequence of steps in the MHTS assembly line. *Courtesy of Garfield, "Facilities Design and Construction," 111.*

Clinic design preoccupied not only multiphasic program planners, but also PMG as a whole. A 1953 record of "Innovations in New Kaiser Foundation Medical Centers" documented this emphasis on intelligent architectural design at the then newly established San Francisco and

Los Angeles centers. “A major innovation in design consists of a decentralization of nurses’ stations and utilities,” it stated. “This is accomplished by turning the usual central corridor into work space for employees only.”¹¹⁵ The workspace was a control station, from which nursing floor managers could directly supervise and observe all personnel. Using mail chutes and dumbwaiters, the control station also handled material transportation to spaces including the laboratory, pharmacy, and storeroom. Each patient room was also better equipped. “When (doctors) entered patients’ rooms, they saw the patient’s chart, all medications... and diet on a panel...with resulting saving of steps and faster service to the patient.”¹¹⁶ Such careful attention to organization of space cast Kaiser Permanente as an innovator in streamlining healthcare workflows and reducing appointment times.

This willingness to innovate set Kaiser Permanente apart from more traditional insurance schemes and hospitals. It also helped generate clientele for an unusually independent healthcare organization; Kaiser was not affiliated with the AMA nor Blue Cross/Blue Shield. Innovation took several forms, from exploring new means of administering wellness checkups (i.e. multiphasic screens), to re-imagining clinic design. Yet a common pattern emerged in the development of new programs at Kaiser. The Permanente Foundation initially viewed innovation as a means of competitive advantage. However, as Kaiser physicians realized the full potential of its pioneering programs, researching how to improve care delivery became a central tenant to practice. In expanding its medical centers, Kaiser wanted to practice *more*, but its unique approach also encouraged its medical centers to practice *differently*.

Nowhere was this more evident than in the multiphasic health screening programs. In the 1950s, Collen found that 30 to 40 percent of new members “came for their first visit just for a checkup.”¹¹⁷ Consequently, he and his staff funneled new patients through the multiphasic

screening process. Before the program became computerized in the 1960s, patient history took a checklist form. Another printed document contained lines for blood pressure, weight, height, and other tests whose measurements were written in by technicians at different stations. To review patient history and lab test results, the physician received a mimeographed preprinted form at the end of this process.¹¹⁸ As Collen and his associates perfected the multiphasic process through the late 1950s, their interventions dramatically cut patient visit times for new members. In fact, Collen noted that the “majority of patients could be taken care of by a fifteen-minute return follow-up visit” given that the bulk of their health data had been collected earlier.¹¹⁹ Doctors at Kaiser could thus mostly focus on patients with serious illnesses. Over time, the introduction of automating technology, and the training non-physician healthcare staff to administer multiphasic screenings also helped to further triage patients.¹²⁰

Multiphasic screenings blurred the line between research and practice, as Collen and his colleagues demonstrated in a 1955 article published in the *Journal of Chronic Diseases*.¹²¹ Focusing on 1,000 patients they had screened in 1952, Collen’s team found compelling evidence in favor of earlier disease detection. For example, out of 64 patients with hypertension, only 51.5% had been previously diagnosed. And out of 20 patients diagnosed with duodenal ulcers, only 20% reported having been previously aware of the condition. The team also found that “97.6% of all patients who took the multiphasic screening tests returned to their physicians 7 to 10 days later for a general physical examination. Of this latter group, 62.4% were referred for supplementary consultations.”¹²² The publication’s authors emphasized the need to not only detect unrecognized diseases, but to also obtain prompt referrals. Breslow expanded upon these sentiments by conducting a cost analysis in a historical review for the *Journal of Clinical*

Epidemiology that same year. He concluded that all material and service costs associated with a battery of twelve tests could be conducted for \$5.04 per person.¹²³

Despite these promising results, opinions on multiphasic health screenings were overwhelmingly critical in the late 1950s and early 1960s. The idea of physicians preemptively searching for disease was novel to America's 1950s medical establishment. Physicians who had long engaged in fee-for-service practices saw multiphasic screenings as a threat and labeled it an "intrusion upon the traditional physician-patient relationship."¹²⁴ Poor quality of screening tests and a general lack of effective medical follow-up on positive screens hindered the new testing regimen, opponents argued.¹²⁵ The AMA bolstered these claims in 1955 when its Council on Medical Service reported that only 15 of 33 screening studies actually produced follow-up consultations with physicians.¹²⁶ The potential to detect disease earlier did appeal to some physicians, including Dr. Henrietta Herbolsheimer, the University of Chicago's director of student health, and her colleague Dr. Billie Ballard. Their 1958 publication in the *Journal of the American Medical Association* demonstrated that multiphasic exams could be less than two-thirds the cost of a full health examination for new college students.¹²⁷ Nevertheless, facing criticisms from the medical establishment, multiphasic health screenings required technological advances in medicine in order to gain widespread credibility.

Automation:

Kaiser's focus on innovation fits into a broader narrative of postwar developments in healthcare technologies. "The advances during and after World War II had been in relatively inexpensive drugs," Paul Starr writes, but "after 1960 they increasingly involved complex equipment and procedures."¹²⁸ Powerful new technologies revolutionized the ways in which multiphasic screens were performed at Kaiser, and Collen later recalled the 1960s as "the

beginning of the diffusion of bioelectronics and digital computers into medicine.”¹²⁹ Advances in bioengineering provided opportunities to design new medical screening instruments, like automated blood pressure cuffs. Simultaneous improvements in digital computing also enabled the creation of complex medical databases.¹³⁰ Thanks to the widespread diffusion of these techniques, Kaiser’s multiphasic health screening centers underwent an “automation” conversion. In this context, “automation” was defined by the application of computer processing (statistical methods or algorithms) to create automatic “decision rules” that sorted patient into positive and negative screens for each test.¹³¹

Having established strong foundations for multiphasic health screenings in the Oakland and San Francisco medical centers by 1952, Garfield and Collen sought out new opportunities to address persistent criticisms of their screening method. Collen, who had studied engineering as an undergraduate, saw the potential applications of recent technological advancements to a wide array of Kaiser’s initiatives. After attending a 1961 congress on medical electronics in New York, he discussed with Garfield the healthcare implications of advancements in digital computing (e.g. creating the decision rules described above) and bioengineering (e.g. designing mechanical prosthetics).¹³² Later that year, the pair gained approval from PMG’s Executive Committee to establish the Department of Medical Methods Research (MMR). With Collen appointed as the director of MMR, Kaiser’s multiphasic screening programs entered a new era complete with new terminology.¹³³ The term “multiphasic health screening” was replaced by “multiphasic health testing services” (MHTS), a transition that indicated the adoption of modern measurement technology and techniques to older multiphasic health screenings.¹³⁴

Financially backed by PHS, MMR pursued two goals in automating its multiphasic programs. The first was to introduce automated equipment to the Oakland and San Francisco

medical centers.¹³⁵ Manual multiphasic exams had primarily relied on qualitative screening tests, but automation replaced these tests with more objective, quantitative laboratory tests. The newly established facilities also contained a large computer center with offices for personnel. As a secondary objective, Collen hired technicians who designed automated decision rules to review patient data.¹³⁶ In the manual programs of the 1950s, doctors had to be present during multiphasic checkups to review patient screens. Now, decision rules completely replaced the doctor's final review of patient results. Between 1965 and 1975, over a half million patients received online (i.e. real-time) reviews of their multiphasic test results at the Oakland and San Francisco clinics.¹³⁷

PHS' involvement in automating Kaiser's MHTS was another example of the convergent responsibilities of physicians and public health officials under prepaid group practice schemes. In 1962, Kaiser Permanente initiated a Multiphasic Evaluation Study aided by a PHS grant. As Collen described it, "the main purpose of the grant was to not only evaluate the efficiency of the automated multiphasic screening program, but to evaluate to what extent the Public Health Service's recommendation of having an annual checkup would decrease morbidity and mortality in adults."¹³⁸ The study marked a critical point in MHTS' history: instead of trying to increase the services they offered patients, Collen and his associates were now using MHTS as a tool for improving population health in the long-term.¹³⁹

The Permanente Foundation established an advisory board for the project in late 1962, with advisors including Lester Breslow and other prominent epidemiologists and biostatisticians. With the support of PHS, the study officially began in 1964 and ran for sixteen years. During this time, Collen and his team worked with PHS to formalize basic requirements for automated multiphasic health programs.¹⁴⁰ The first part of Collen's checkup consisted of a two-hour

battery of tests and an automated, 200-item questionnaire that could provide provisional diagnoses. Patients answered the questionnaire by placing punched IBM cards in either the “Yes” or “No” sections (Figure 3). A header card containing the patient’s identifying data allowed healthcare staff to duplicate patient responses as medical records.¹⁴¹



Figure 3: A patient completes a self-administered medical history in 1978 by sorting punched questionnaire cards originally in the top compartment into the “YES-TRUE” and “NO-FALSE” compartments underneath. Patients turned these questionnaires into a technician. Data was then relayed to a central data processing system, where automated decision rules helped physicians and nurse-practitioners decide on follow-up regimens for each patient based on their responses to questionnaire and their laboratory results. *Courtesy of Collen, “History of MHTS,” 35.*

After patients had filled out the questionnaire, they underwent more quantitative procedures like blood chemistry tests and height and weight measurements.¹⁴² These data were also recorded on IBM punched cards and fed immediately into Kaiser's central database. Using these data, Kaiser's medical centers established ratios comparing the likelihood of screening tests accurately detecting disease to the likelihood of a false positive.¹⁴³ Tests with high likelihood ratios increased the confidence of Collen's associates that test questions were accurately predicting patients' abnormal conditions.

MMR worked vigorously to demonstrate the value of MHTS to both the general public and the medical establishment. As multiphasic centers expanded to new Kaiser medical centers, local newspapers provided a tremendous publicity boost. A newspaper article in the 1968 *Honolulu Advertiser*, for example, stated that, "Nobody likes to take a physical...If you must take an examination, then the answer is a 12-stage check-up in less than an hour which is offered by Kaiser Medical Center."¹⁴⁴ The article ended by advertising MHTS operating hours "at Kaiser, between 5 p.m. and 9 p.m. every Thursday evening" and emphasizing the "family" atmosphere of the center. Academic and industry journals also began profiling MHTS in the late 1960s. For example, *Modern Hospital*, a magazine focused on hospital administration issues, ran a piece on Kaiser's MHTS as a means of having industry directly engage with the program. In the article, journalist Margaret Drossel outlined the tests patients underwent at sixteen stations and provided printouts of sample results. She described Kaiser's MHTS as "almost an instant 'sell-out,' handling a near-capacity 40,000 patients in the first year of operation" at Oakland and San Francisco.¹⁴⁵ PHS further cultivated establishment interest in MHTS through a series of annual meetings. Between 1958 and 1969, these meetings brought together key members of the

medical industry—Kaiser Permanente, medical device corporations, and other medical organizations—to explore new applications of technology to medical practice¹⁴⁶

Kaiser's leaders also sought to explain the positive effects of their program on healthcare work practices. Because PMG executives had supported the establishment of a School of Nursing in 1947, doctors could play a lesser role in multiphasic testing.¹⁴⁷ The frequent use of nurse practitioners instead of physicians to conduct physical examinations exemplified how task shifting could lower costs and built stronger capacity among non-physician healthcare personnel.¹⁴⁸ To publicize such innovations in clinical workflows, in 1978, Collen, Garfield, and their associates published an anthology of essays on various elements of multiphasic health testing services. The work was critical in disseminating the results of three decades of MHTS practice. Collen outlined what a typical visit for a patient would look like by 1978:

When a person makes an appointment for a multiphasic health checkup, he is sent printed instructions on how to prepare for it....Up to 220 patients are scheduled each day, of whom about 90% keep their appointments....When the patient arrives, the receptionist identifies him, selects his deck of prepunched cards, and verifies the data on the identification card.¹⁴⁹

At each stage in the assembly line process, data were relayed via punch cards to Kaiser's central computing system. Within twenty days, the computer could process all data for an individual patient, including offline data that technicians entered after a patient's multiphasic testing appointment.¹⁵⁰ Physicians or nurse practitioners would then identify individual cases requiring additional examinations or specialty care. Garfield visualized this entire process in the diagram below (Figure 4).¹⁵¹

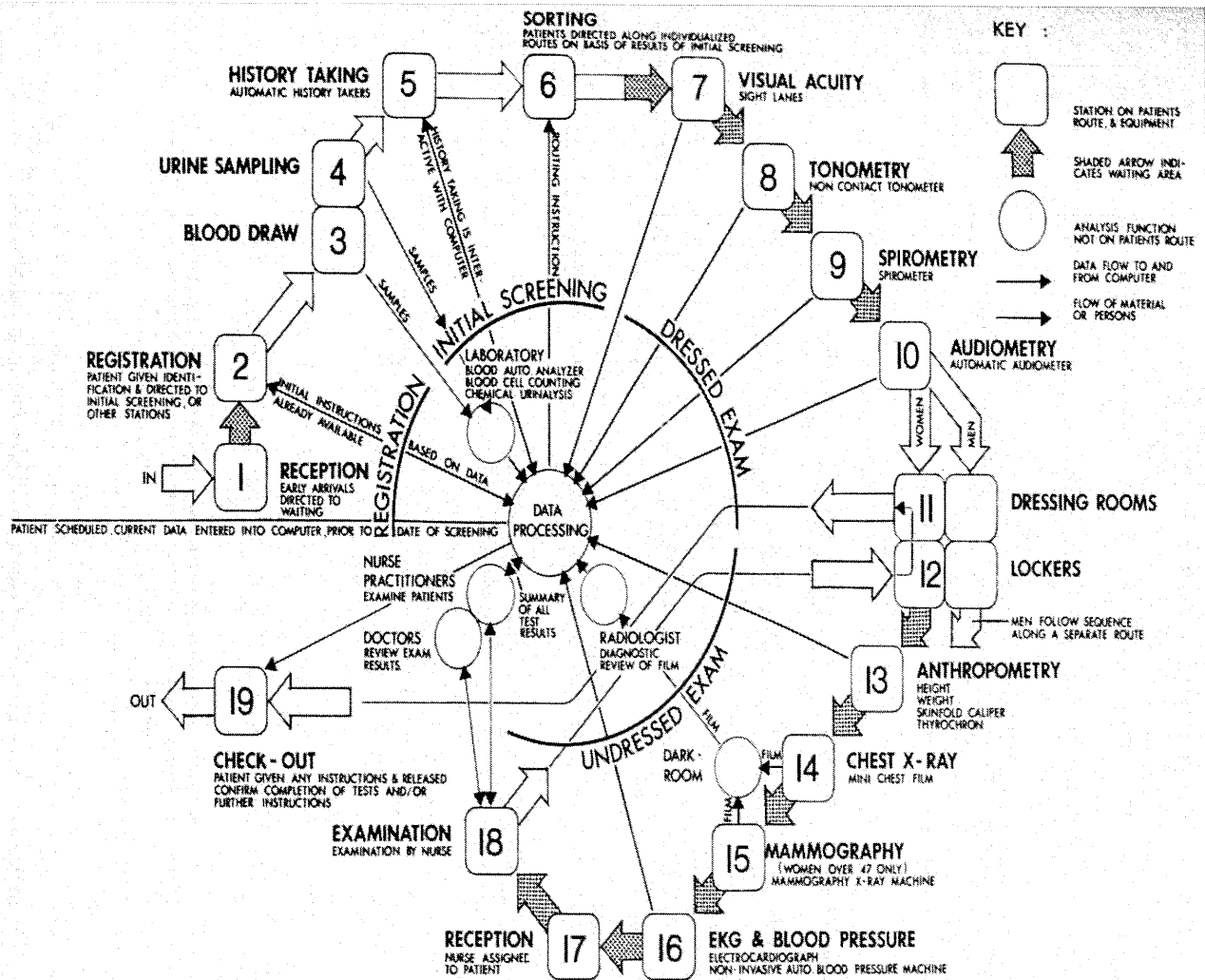


Figure 4: Sidney Garfield's 1978 Flow Diagram of the MHTS Assembly Line. Patients first entered at the reception desk (Station 1) and made their way through a series of screenings organized into "initial screening," "dressed," and "undressed" phases. At each point along the way, data was being relayed back via IBM punched cards to the central data processing system depicted in the center of the diagram above. Of important note here is that this flow diagram included Garfield's Delivery System described in a later section. This meant that data was processed and immediately provided to the medical team by the end of the patient's screenings. The patient then underwent a final examination conducted by a physician or nurse-practitioner (Station 18) before ending their visit. *Courtesy of Garfield, "Facilities Design and Construction," 105.*

Under Collen's guidance, the Department of Medical Methods Research embraced new advancements in bioengineering that allowed for increased testing accuracy. However, there was an important distinction between the department's involvement in medical computing and bioengineering. "We needed some bioengineering in our work, but bioengineering needs a large shop," Collen later recalled. "When the department started, we did have a department of bioengineering, but we gradually phased that out. It involved too much work."¹⁵² Kaiser Permanente's exploitation of medical information systems became the centerpiece of their research into practice strategy. By the late 1960s, MMR was attempting ambitious projects extending beyond MHTS. Of these, the most innovative was a pilot hospital computer system, a precursor to modern electronic health records.¹⁵³

Multiphasic Programs as a Potential Solution to Gaps in National Healthcare

The decision to pursue a singular research-to-practice strategy favorably positioned Kaiser Permanente to reshape primary care on a national level. By the mid-1960s, MHTS had received significant recognition as a viable means of improving care delivery. In 1966, Collen was invited to testify before the U.S. Senate's Special Committee on Aging at a series of hearings on the use of multiphasic screenings in managing chronic diseases. When asked by Senator Maurine Neuberger about Kaiser's contributions to multiphasic screenings, Collen responded, "I think what we have done is to put together the largest-coordinated program that functions on-line with a computer."¹⁵⁴ Indeed, Kaiser's willingness to tinker with the standard physical examination was revolutionary, compared to the progress of competitors like Blue Cross/Blue Shield in the 1950s. As physician Paul Han argued, the Kaiser Foundation Health Plan's growth as an institution during this period was undoubtedly linked to an overwhelming patient demand for "health checkups".¹⁵⁵ In the first year of automation, multiphasic screenings

increased dramatically, servicing more than 35,000 patients in Oakland and San Francisco. Within the first ten years of automated MHTS, these two medical centers alone provided a total of 500,000 examinations. Given this vast amount of data, Collen and his associates began to see themselves as contributors to overall population health. Kaiser's physicians were given the latitude and data collection capabilities to track populations of patients over long periods of time.¹⁵⁶ The organization now felt ready to address national policy concerns regarding inflated medical costs and care for the elderly.

The creation of Medicare in July 1965 was a momentous piece of healthcare policy. But by the time the Special Committee on Aging met in September 1966, public officials had yet to articulate how to effectively manage healthcare for the elderly. In addressing the frustration and lack of solutions to restructuring healthcare financing and delivery, Collen made three significant points at the 1966 hearings. Firstly, he emphasized the important advances in bioelectronics, remarking, "Physicians cannot possibly criticize the fact that automated equipment usually performs tests more accurately than people."¹⁵⁷ Secondly, Collen provided a wealth of data to the committee on cost reductions, demonstrating that "the total unit cost of an examination for a patient to go through the 20 stations... was \$22.48."¹⁵⁸ Lastly, Collen acknowledged that multiphasic health testing could not cure chronic disease, but argued that if the disease were detected early enough, symptoms could be prevented or at least postponed. In his words, "A person couldn't care less if he has the genes for diabetes and lives to 100 without suffering from it."¹⁵⁹

In spite of the suggestions Collen and others made to the Senate Committee, the 1966 hearings did little to spur national legislative action to expand multiphasic testing.¹⁶⁰ They did, however, promote more collaboration among multiphasic health testing services both

domestically and internationally. In the late 1960s, the impetus to expand automated multiphasic health testing gained considerable momentum when Gilbert Devey, the Program Director for Engineering Systems at the National Science Foundation, organized the Engineering Foundation Research Conferences. The conferences were a series of joint meetings for knowledge sharing between physicians and engineers. A surge in similar research conferences followed, including, several symposia on MHTS sponsored by the Society for Advanced Medical Systems and the International Health Evaluation Association.¹⁶¹ This recognition prompted the medical establishment, too, to acknowledge the importance of multiphasic programs by establishing the Intersociety Committee on Multiphasic Health Screening later that year. The intersociety consisted of ten major national medical groups, including the AMA. During this period, MHTS at Kaiser Permanente became an international model.¹⁶² Groups of Japanese and Dutch physicians both toured Kaiser's MHTS facilities at the Oakland Medical Center in the 1970s.^{163,164}

Near the end of the 1960s, multiphasic programs had evolved from manual screenings to incorporate automated tests; had attracted a considerable membership base within Kaiser's medical centers; and were recognized on both a domestic and international scale as a means of restructuring healthcare delivery to incorporate preventive measures. The model had gained incredible traction in a short period of time, especially aided by Collen and his associates at Kaiser Permanente.^{165, 166} Still, the program had yet to address another key aspect of primary care: the socioeconomic determinants of health, including diet and exercise. This changed with Garfield's introduction of a new framework, known as the "Medical Care Delivery System."¹⁶⁷

“Total Health”: Medical Care Delivery Systems

Sidney Garfield’s original motive for supporting MHTS was his frustration with the healthcare system. In 1978, he wrote of the “markedly increased demand, inflationary costs, and maldistribution of physician services” produced by free market organizations. Government interventions in 1966 had produced Medicare and Medicaid to fill gaps in access, but had “only aggravated existing impaired accessibility and inflationary costs.”¹⁶⁸ In Garfield’s opinion, there existed a fundamental tension between sick and well patients both of whom were competing for sick care physician services. To separate the “well, worried-well, asymptomatic sick, and sick” patients, Garfield conceived a new system in which patients’ first point of contact with the healthcare system was MHTS and not a physician appointment.¹⁶⁹ Instituting MHTS at Kaiser had been the first step in this process. Now, bolstered by a 1968 PHS health services research grant, Garfield and Collen set out to introduce a new model of care under the framework of a “Medical Care Delivery System.”¹⁷⁰

Collen described the Delivery System as one “in which physicians and nurse practitioners would do the physical examination evaluation at the end of the multiphasic before (patients) left, so that everything in a few hours would be entirely completed.”¹⁷¹ In a sense, this was not a novel concept, but a means of optimizing earlier practices. The Delivery System also introduced a “health care service” consisting of public health media, exhibits, and counseling to educate and engage with patients. Interestingly, this service was pioneered not by Morris Collen, but by his wife, Bobbie. Trained as a nurse, she became the director for Kaiser’s educational outreach initiatives.¹⁷² Mrs. Collen contributed to the 1978 anthology of essays, outlining objectives for educational services at each stage of a patient’s experience with Kaiser Permanente. The diagram below provides a rough outline of how these services were provided (Figure 5).¹⁷³

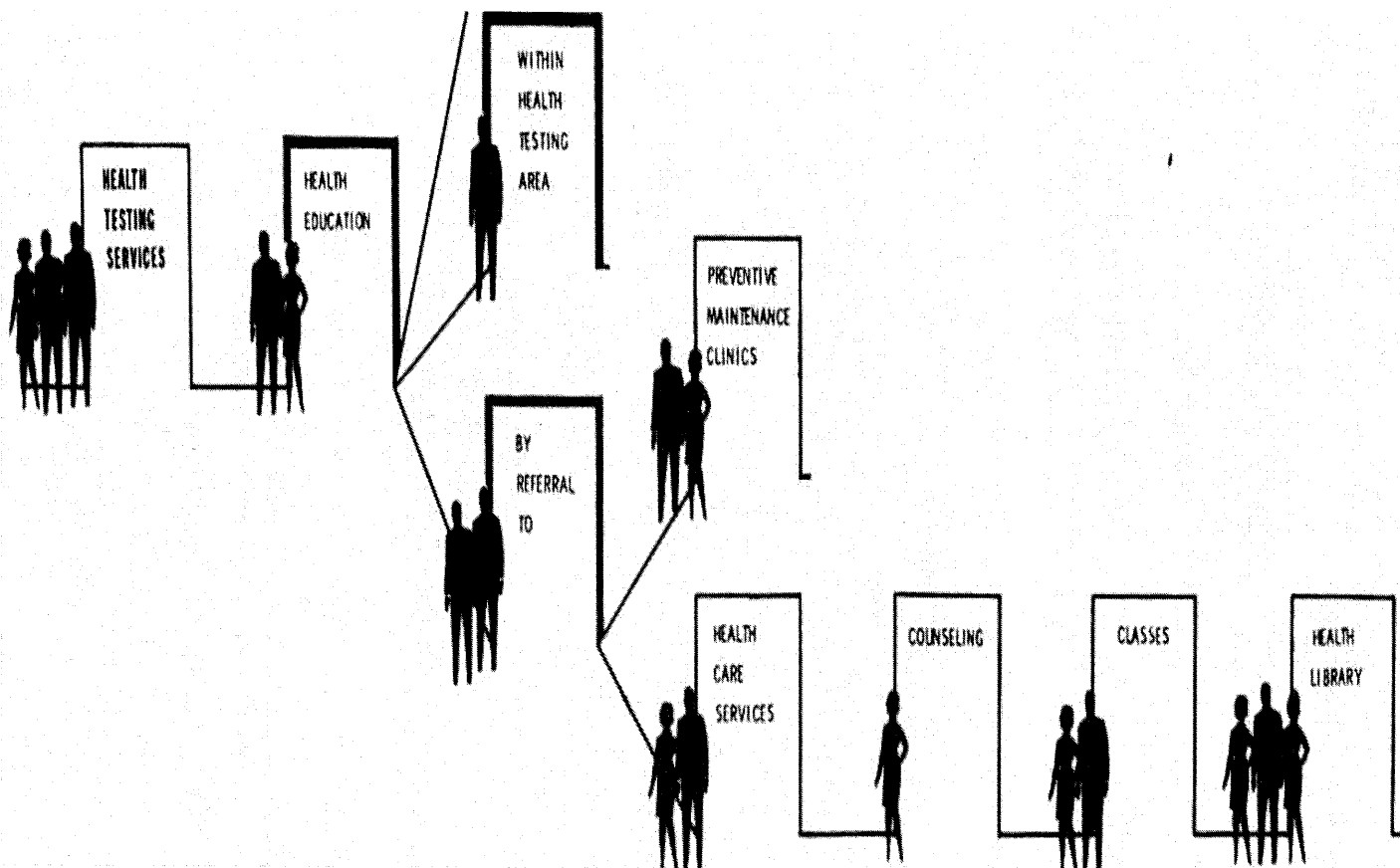


Figure 5: Bobbie Collen, the director of Kaiser’s Educational Outreach Initiatives, contributed a chapter to the 1978 anthology, “Multiphasic Health Testing Services.” She provides numerous photographs and diagrams in her chapter on educational outreach, including the diagram above. The diagram represents patient flow through educational settings sponsored by Kaiser, and includes numerous services, including “counseling,” “classes,” a “health library,” and “preventive maintenance clinics.” These educational efforts were integrated with MHTS under the Medical Care Delivery System framework championed by Sidney Garfield. Educational efforts represented a dramatic shift in Kaiser’s primary care operations, with Kaiser moving beyond the clinical setting to address socio-economic determinants (like diet and exercise) that affected patient health. *Courtesy of Bobbie Collen, “Health Education as an Adjunct to MHTS,” 370.*

More specifically, Bobbie Collen’s work focused on providing initial guidance to patients new to the MHTS program. When patients first entered MHTS facilities, a nurse or technician provided them with a pamphlet explaining the MHTS process and answered any questions. The entry room of a standard Kaiser multiphasic facility also displayed pictures of the “steps to

health” in the MHTS process.¹⁷⁴ As patients made their way through different testing stations, they encountered conveniently located panels (like the breast cancer detection panel below) that explained the rationale behind the testing station (Figure 6).¹⁷⁵ When patients left the facility with a follow-up plan of action, they had access to a wide range of additional health counseling and education services for proper diet and exercise. Kaiser also put on exhibits for the general public, including the “Story of Life” (Figure 7).¹⁷⁶ For years, Collen and others had emphasized the importance of long-term patient supervision through MHTS. But this was the first time the Permanente Health Plan had explicitly expanded its responsibilities to include patient life outside of clinical settings. These services were not only critical in addressing socioeconomic factors underlying patient health, but also could be provided at a low cost by non-physician healthcare staff.¹⁷⁷



Figure 6: A sample health panel patients would have seen at Kaiser's MHTS facilities in 1978. These panels were located outside each testing station at sequential MHTS facilities and educated patients before they underwent each procedure. The Breast X-Ray panel seen here provided patients with some context about breast cancer before entering the screening room. It reads: "Breast X-rays are helpful for: detecting breast cancer early, especially for women who no longer menstruate. It is very important that you check your breasts once a month between your visits to your doctor. For instructions on how to properly examine yourself, study the exhibit on the wall of this waiting room." *Courtesy of Bobbie Collen, "Health Education as an Adjunct to MHTS," 377.*

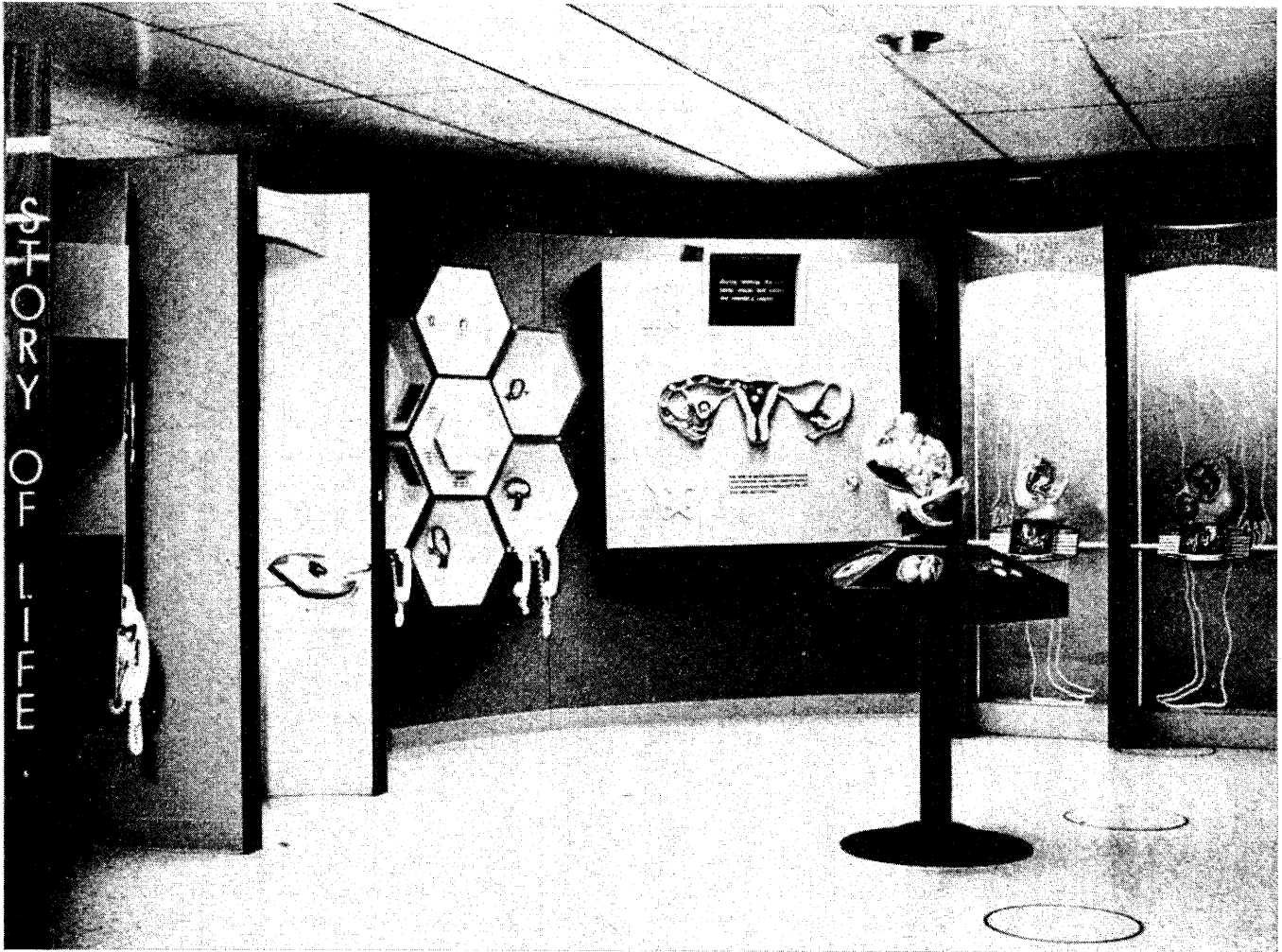


Figure 7: Kaiser’s “Story of Life” Exhibit, a popular exhibit put on by Bobbie Collen’s Educational Outreach team in the 1970s. The exhibit was a part of Kaiser’s efforts to educate the general public about human reproduction. The exhibit began with transparent models of male and female bodies, proceeding to demonstrate three-dimensional models of the male and female reproductive systems. The exhibit also included panels including, “How Life Begins,” seen at the center of the photo above. This panel contained an enlarged model of the uterus within which sequentially lighted eggs moved through the ovaries, fallopian tubes, and uterus to demonstrate fertilization. The hexagonal component to the left of this panel depicted each stage of pregnancy. These outreach initiatives represented the first time Kaiser’s medical centers were moving beyond the clinical setting to engage directly with the general public, and encourage long-term good health. *Courtesy of Bobbie Collen, “Health Education as an Adjunct to MHTS,” 399.*

The Delivery System, then, was an important extension of the existing automated multiphasic health testing services Kaiser had provided since the early 1960s. As part of this new framework, Garfield wanted to analyze the differences between new patients receiving standard appointments and new patients receiving MHTS. He undertook a randomized, controlled trial at the Oakland Medical Center in the early 1970s. At the time, Kaiser Permanente was serving approximately 130,000 Health Plan members at Oakland, with fourteen specialty clinics providing sick-care services.¹⁷⁸ Garfield's study collected data for five years on new patients entering the plan at the Oakland Medical Center.¹⁷⁹ Enrollees were randomly assigned to either a control group receiving the traditional medical system (TMS) or an experimental group receiving MHTS as the first point of entry. The same doctors provided services to both groups. Charts for 4,369 patients entering the two systems were reviewed and sorted by health status.¹⁸⁰ Evaluations of these charts revealed significant reductions in physician cost and hours in dealing with MHTS patients, compared to TMS patients of comparable health status. MHTS patient entry required one-third as many physician hours as TMS, and reduced costs for entry workup by 72 percent. For each 1,000 entrants into the TMS and MHTS systems, MHTS produced a 57% saving in physician hours and a 56% saving in cost over a 12-month period.¹⁸¹ The average number of days patients waited to access health services also declined dramatically: compared to TMS patients, MHTS patients waited 27 fewer days on average in January 1972, and 20 days on average by January 1973.¹⁸²

To understand patient and healthcare staff's perceptions of the Delivery System, Garfield also conducted a satisfaction survey. While results revealed generally equal satisfaction levels between MHTS and TMS, patients in the MHTS group expressed higher satisfaction with the earlier appointments made available in MHTS.¹⁸³ Healthcare staff across professional groups

listed more benefits from MHTS than problems, although their complaints reflected a need to route lost patients and improve patient familiarity with the Delivery System model. Overall, however, the evaluation indicated that it was possible to make dramatic improvements to patient entry by having patients first undergo a more efficient and accessible MHTS screen, and then matching patient needs with services beyond the clinic.¹⁸⁴ Reflecting on the study in 1978, Garfield referenced the traditional model of entry “through the physician” as being constrained by the physician’s ability to both accept new patients and follow-up on existing patients. In the Delivery System model, on the other hand, entry and follow-up were two separate services with MHTS handling entry through nurse physical examinations (eliminating the need for a doctor at the initial patient visit).^{185,186} Provision of services outside of the clinical setting also matched patients with more appropriate resources than could be provided at a clinic alone, increasing patient satisfaction and reducing unnecessary appointments.¹⁸⁷

The promising results from Garfield’s evaluation of the Delivery System pushed Kaiser Permanente towards his vision of the “total health care program.”¹⁸⁸ In many ways a precursor to contemporary models of a “patient-centered medical home,” the total health care program featured a combined practice, in which a team of “two physicians, six nurse practitioners, a health educator, and mental health counselor, took care of a group of people.”¹⁸⁹ This team-based approach to care was meant to systematize dealing with various kinds of disease. Acute minor illnesses and chronic disease care could be managed by paramedical staff. As historians Tom Debley and Jon Stewart argue, this would leave more serious conditions to the medical team described above.¹⁹⁰ Under this model, the medical team tracked referrals to secondary/tertiary care, maintained a central health data file, and monitored the health progress and medication use

of individual patients.¹⁹¹ Collen believed that coupled with health education and counseling services, this model would greatly benefit patients:

For the humanistic part of diagnosis and treatment, apparently nurses do better than physicians...people can get in, because instead of three or four health care providers, there are now twice as many because nurse practitioners are more economical than physicians.”¹⁹²

Garfield did not live long enough to see the full documentation of the total health care program, but his staff had decided to continue evaluating the total healthcare model through the early 1980s.¹⁹³ By this time, however, the healthcare climate had changed significantly.¹⁹⁴ Since 1973, the Department of Medical Methods Research and Kaiser-Permanente as a whole had been moving away from the innovative, research-to-practice ideology of the early years. Collen explained the gradual decline of research into medical computing at Kaiser-Permanente:

In 1973, the National Center for Health Services Research and Development discontinued its health services research centers, and they had been supporting us at approximately half a million dollars a year. The Kaiser organization had been contributing about an equal amount. Nineteen seventy-three was a bad year for us because the organization was then under wage and price control. There was a recession, and... the executive committee would not approve my request to continue the prototype hospital information system. So, as a result, we closed down the hospital computer system in San Francisco, and discontinued further work in computer applications to medicine. The multiphasic system in Oakland has continued to this day essentially unchanged. It still sees 150 to 180 patients a day.¹⁹⁵

The discontinued research grants had done more than support the automation of MHTS. Health Services Research funding had also gone toward piloting a computerized total medical information system that could be used in a hospital's inpatient and outpatient unit. Led by Collen in the early 1970s, this initiative was well ahead of its time. Collen had hoped that a computerized record system would allow “any physician anywhere, anytime” to obtain patient data without the difficulties of a manual record system.¹⁹⁶ With such an abrupt end to MMR funding, these pilots also ended. Kaiser's automated MHTS program persisted, but no longer did

Kaiser's basic medical practice push the boundaries of medical computing, or involve direct integration of new research into its practice. Instead, Kaiser shifted its computing operations towards primarily administrative services.^{197,198}

Systems Evaluation of MHTS:

Multiphasic health testing services were standard components of care delivery across several institutions by the 1980s, but segments of the medical establishment still were slow to adopt this approach. As recently as 1986, Kaiser's competitors (including Blue Cross) did not cover checkups because they regarded them as elective care, rather than insurable events.¹⁹⁹ The reason, Collen wrote in 1978, was that "the development and operation of large technological systems require great resource investments over long periods of time."²⁰⁰

On a more theoretical level, Collen cited the ongoing struggle to ensure that multiphasic screens were useful. Without a follow-up visit and linkage to care, automated multiphasic screenings were nothing more than "a package of laboratory tests and procedures."²⁰¹ Automation could facilitate data processing, but could not independently ensure that patients came to appointments or complied with treatment regimens. Potential reasons for this gap vary from patient to corporate level issues. Even today, Kaiser Permanente and many other healthcare organizations continue to struggle with linking all of their patients appropriately into care.²⁰² Another factor complicating the expansion of MHTS was the pushback from individual physicians. Private physicians hesitated to support MHTS because it was more lucrative for them to individually bill patients' insurance for each test involved. As Kaiser physicians worked together in a group practice, individual billing was irrelevant to their calculus.²⁰³

Despite these barriers, the Department of Medical Methods Research demonstrated cost reductions and efficiency improvements in the automated MHTS program across their West

Coast operations. Collen released cost analyses on MHTS at the beginning and end of Garfield's Delivery System evaluation. The first looked solely at the cost-effectiveness of an automated multiphasic health testing program. The direct costs of running automated MHTS at the Oakland center were determined to be \$12.34 per patient, accounting for equipment depreciation, wages of lab technicians, and supplies. Accounting for indirect operating expenses, the cost of sending a patient through fifteen stations was \$14.28. These initial observations were heavily dependent on patient volume remaining consistent, and provided little cost-benefit analysis. However, this preliminary study provided the first credible data demonstrating low-costs of automated multiphasic testing programs.²⁰⁴

The second cost analysis compared traditional medical care (TMC), MHTS, and MHTS-RN (a group receiving physical examinations from a nurse instead of a doctor). Following Garfield's Delivery System evaluation, Collen identified three significant findings in his cost analysis. Firstly, the average total cost for a health examination was \$61.42 under TMC. Providing an initial multiphasic health evaluation followed by either a physician (MHTS) or a nurse (MHTS-RN) examination decreased the total cost to \$44.80 and \$43.10, respectively. Secondly, in terms of total physician time, TMC required on average 43.6 physician minutes to conduct both the initial examination and follow-up evaluation. In contrast, the MHTS and MHTS-RN models reduced the physician time to 25.5 and 13.8 minutes.²⁰⁵ Thirdly, beyond these baseline reductions in cost and time, Collen also found that the comprehensiveness of Kaiser's MHTS resulted in prolonged economic impacts of up to one year. As depicted in the table below, patients receiving MHTS saved Kaiser \$25,213 per 1,000 patients over a twelve-month follow-up period. MHTS groups also cost only 80.8 percent of TMC costs in the same time frame (Figure 8).²⁰⁶

Table 17-13. Comparison of Impact on 12-Month Total Service Costs \$/Yr/1,000 Examinees, Adjusted for Age, Sex, and Health Status*

	TMC	MHTS	MHTS-RN
MD costs (percent of TMC)	\$ 93,673	\$ 68,714 (73.4)	\$54,683 (58.4)
Total costs (percent of TMC)	\$131,179	\$105,966 (80.8)	\$98,629 (75.2)

Figure 8: A table from Garfield’s chapter on the Delivery System in “Multiphasic Health Testing Services.” The table compares the impact of three different models of care on total service costs over a 12-month period. Of particular interest is the second row, depicting total costs per year per 1,000 patients. The first column, TMC, represents patients who entered medical care through the traditional route (seeing a doctor at the initial point of care). The MHTS column depicts costs for patients whose first point of contact was instead a multiphasic exam. The MHTS-RN column depicts costs for patients who received a nurse-practitioner exam at the end of their MHTS visit as opposed to a doctor’s exam in the MHTS approach. The table’s second row depicts clear cost savings in employing an MHTS or MHTS-RN approach as the point of entry for new patients. Both approaches are less costly in comparison to TMC, reducing costs by 19.2% and 24.8% respectively. *Courtesy of Morris Collen, “Systems Evaluation of MHTS,” 523.*

In summarizing MHTS, Collen outlined various benefits to the patient, physician, medical facility administrator, and health care systems planner. MHTS dramatically reduced patient wait times, effectively detected disease prior to the emergence of debilitating symptoms, and decreased mortality of potentially postponable conditions (discussed in the next section).²⁰⁷ Physicians benefited from the central referral system and information control, alongside steady improvements in data processing and the overall quality of the health checkup.²⁰⁸ MHTS also converted medical facilities into “health centers.” From the viewpoint of the medical facility administrator, this allowed for quality health examinations at low cost and customization based on specific population needs.²⁰⁹ And from a larger health systems perspective, MHTS contributed large quantities of population data that researchers could use to observe trends, detect disease earlier, and improve access to and/quality of primary care services. Through the use of MHTS, then, key members of the healthcare establishment gradually came to see their

responsibilities differently. Breaking from the traditional mold of sickness care, healthcare professionals now saw cost-effectiveness in encouraging long-term well-being. Evaluations identifying health improvements soon confirmed benefits to patients as well.²¹⁰

Effect on Patient Care:

Ultimately, the most valid criticisms of Kaiser's MHTS programs came from within Kaiser Permanente itself. A comprehensive evaluation of the Kaiser Health Plan's multiphasic testing program was published in 1985, twenty-one years after the study began. In 1964, Collen and his associates had established a randomized control trial funded by the U.S. Public Health Service to evaluate the efficacy of automated multiphasic health testing services. By 1985, formal research into medical computing had ended, but the department continued to track patients from the 1964 study to observe long-term trends in mortality, disability, and other health outcomes. The study followed an "experimental group" that had been phoned annually to encourage members to take a multiphasic health checkup (MHC), as well as a control group that received no contact.²¹¹ About 60 to 65 percent of the study group—and 20 percent of the control group subjects—received MHCs each year.²¹²

Despite these limitations, the study still purported to have found significant results across the sixteen-year follow-up period. In terms of exposure to MHTS, the experimental group received almost 2.5 times as many checkups on average as the control group subjects. Only 15.7 percent of the experimental group had received no checkups, as opposed to 36.2 percent of the control group. Furthermore, the average number of hospitalization days was higher in the control group (10.38) than the experimental group (10), but the distribution of hospitalizations did not differ significantly. Mortality trends, too, seemed similar between the control and experimental group.²¹³ The total death rate was also 2 percent lower in the experimental group, a statistically

insignificant difference. However, death rates due to “potentially postponable” causes, particularly colorectal cancer and hypertension, were 30 percent lower in the experimental group.²¹⁴

These inconclusive results were disappointing in light of the tremendous publicity multiphasic testing had received in the late 1960s. Dr. Gary Friedman, another key figure in the history of automated multiphasic health testing, had been first author on the evaluation but was well aware of its flaws. Much younger than Collen and Garfield, Friedman had not participated in the initial development of MHTS. But when he joined MMR in 1968, his epidemiology training qualified him to critique years of research into preventative health at Kaiser Permanente.²¹⁵ Friedman and his colleague, Joe Selby, found that the randomized trial had flaws in its analysis methods—specifically, that Collen had overemphasized statistically insignificant findings in subgroups of patients. In a 2007 interview, Friedman reflected on the publication with embarrassment, stating, “Morrie sort of latched on to this because it proved what he was hoping to prove.”²¹⁶ By applying a critical eye to “Morrie’s baby,” Friedman was able to re-evaluate an institutionalized process while still effectively using MHTS data collected over the course of 40 years.²¹⁷ In the years that followed, Friedman and Selby drew on their critiques of Collen’s MHTS program to analyze epidemiological trends, consulting multiphasic data to study colorectal cancer, smoking, and cardiovascular disease.²¹⁸

Yet their criticism did not undermine Collen’s decades of work on multiphasic testing. While Friedman acknowledged that his own generation was “really interested in scientific proof and evaluation,” he did not dispute the validity of multiphasic health exams; MHTS had indeed decreased the number of potentially postponable mortalities.²¹⁹ In 2016, commenting on his earlier valuation of Collen’s work, Friedman stated, “I’m still very proud of the publication but

stand by my statement. These studies definitely had benefits, but mainly to potentially postponable mortalities for conditions like hypertension.”²²⁰ In addition, Friedman cited accounts of Kaiser’s physicians getting frustrated with tests inappropriate for an MHTS setting, such as highly sensitive blood sugar exams that unnecessarily referred many non-diabetic patients to physician care. Nevertheless, he emphasized that he had continued to use the multiphasic health database as a valuable epidemiological tool during his tenure as director of MMR from 1991 to 1998.²²¹ Friedman’s retrospective insights provide a glimpse into Kaiser’s practice today: although multiphasic research programs were gradually phased out beginning in 1972, all the multiphasic tests shown to actually prevent mortality are still in use.²²² Thus, Friedman’s evaluations did not discredit Collen’s work; rather, they restored a semblance of the innovative “research-to-practice” framework that had driven Kaiser’s to first adopt multiphasic health programs.

The Legacy of Multiphasic Health Testing:

Kaiser’s innovative growth strategies between 1948 and 1973 were a product of the competitive American healthcare landscape after World War II. Fending off a series of market-based and legal attacks from traditional insurers and individual physicians, Kaiser had to distinguish itself from its competitors if it hoped to survive beyond the end of the war. The Permanente Health Plan did not propagate any established notions of medical care; it was not a traditional indemnity insurer or hospital practice. Nor was it a proposal for a national health scheme, or an affiliate of the influential American Medical Association. Rather, the Health Plan reflected tremendous organizational flexibility and creativity, as evidenced by its group practice, prepaid schemes, and willingness to conduct research in order to streamline operations and

improve care delivery. These attributes cultivated a strong research-to-practice ideology and allowed Kaiser to thrive.

Multiphasic health testing represented the first time that Kaiser directly integrated research into actual provision of medical care. The idea that research could improve daily practice fundamentally changed the role of physicians from stagnant practitioners to dynamic reformers within Kaiser's health facilities. Over the course of three decades, the Medical Methods Research department shielded MHTS from internal bureaucracy and political tensions. Free to grow independent of administrative conflicts, the MHTS program brought together two healthcare actors that had previously seen their goals as entirely separate. Government agencies like the U.S. Public Health Service had traditionally been responsible for matters of population-wide health in the long run, while doctors engaging with the conventional fee-for-service model saw themselves as healers of illness in individual patients. Through a partnership that allowed the Public Health Service to support population-level research into preventative health measures, physicians in Kaiser's group practice began to see their role as encompassing long-term health interventions, and not just episodic patient interactions in the clinic.

By the early 1970s, multiphasic health testing at Kaiser's medical centers had succeeded in pushing preventative health measures onto the national agenda. Morris Collen's testimony at Senate Committee hearings brought national recognition to the MHTS pilots that Kaiser had implemented on the West Coast. At research symposia, engineers and physicians began to address technological barriers related to MHTS. Led by Collen and Garfield, Kaiser's MHTS capitalized on advances in medical computing and bioengineering to address early critiques of the accuracy and practicality of multiphasic health testing. By the late 1960s, multiphasic health testing had spread globally, and was increasingly moving in the direction of standardization.

MHTS programs fundamentally changed the practice of primary care at Kaiser. The organization's research-to-practice ideology permitted rapid reconfigurations, based on research outcomes, of care delivery practices at medical centers under the Kaiser Foundation. Physicians and paramedical staff could now follow up with patients, and re-evaluate criteria for diagnoses utilizing data from multiphasic exams. Task shifting also increased within medical centers, with the introduction of Garfield's Medical Care Delivery System that charged nurse practitioners with providing physical examinations in a doctor's stead. This framework for care delivery also encouraged physicians to think beyond the boundaries of medical facilities and to consider socio-economic factors affecting their patients' long-term well-being. When first introduced, multiphasic health testing proved to be cost-effective and efficient in reducing the complexity of healthcare workflows.

Funding for direct research in medical computing ended during 1973, but Kaiser Permanente continued to run its multiphasic health testing programs and utilize the data generated by MHTS. The work of a younger generation of physicians, including Joe Selby and Gary Friedman, brought a more critical perspective on these pursuits. While Friedman and Selby did not completely reject Garfield and Collen's vision to integrate MHTS into a long-term "total health care" project, they did question its actual effect on patient health outcomes. Their critiques of earlier programs allowed them to pursue a number of epidemiological studies on chronic disease within the Health Plan from the 1980s to the present day. The impact of multiphasic health screenings remains controversial, with contemporary reviews of periodic health examinations struggling to identify clear links between health screenings and reduced patient morbidity and mortality.²²³

Despite ongoing critiques of MHTS, Garfield's initial vision of a "team-based" model of preventative care, grounded in multiphasic health testing, is still manifest in today's medical establishment. The 2010 Affordable Care Act has made preventative health the centerpiece of the federal government's strategy to provide more equitable, high-quality care. U.S. healthcare spending has continued to increase, reaching \$3 trillion in 2014.²²⁴ And to combat both increasing costs and sub-standard quality of care, healthcare providers have been encouraged by the Agency for Healthcare Research and Quality to provide primary care using a Patient-Centered Medical Home model.²²⁵ All of these changes reflect the influence of Kaiser's multiphasic health programs on primary care practice today. What began in the 1950s as a means of competing with traditional insurers transformed Kaiser's primary care model over the next two decades into a high-functioning system capable of flexibility and innovation. As the healthcare landscape continues to shift in the twenty-first century, the legacies of automated multiphasic health testing should not be forgotten. More than a technological experiment, MHTS called for an innovative approach to primary care: one aimed at reducing costs, improving efficiency, and preventing disease on a population-wide level. It is a call still resonant in American healthcare today.

¹ Hughes, Morris F. Collen, MD: *History of the Kaiser Permanente Medical Care Program*, 19.

² Beatrix Rebecca Hoffman, *Health Care for Some: Rights and Rationing in United States since 1930* (Chicago; London: University of Chicago Press, 2013), 101.

³ For more information on the history of Kaiser Permanente, see Smillie, John G. *Can Physicians Manage the Quality and Costs of Health Care?: The Story of the Permanente Medical Group*. New York: McGraw-Hill, 1991; Hoffman, Beatrix Rebecca. *Health Care for Some: Rights and Rationing in United States since 1930*. Chicago; London: University of Chicago Press, 2013; Paul Starr, *The Social Transformation of American Medicine* (New York: Basic Books, 1982); Hendricks, Rickey Lynn, *A Model for National Healthcare: The History of Kaiser Permanente*, (New Brunswick, N.J: Rutgers University Press, 1993); and Stevens, Rosemary. *American Medicine and the Public Interest*. Updated ed., with a new introduction. Berkeley: University of California Press, 1998.

⁴ Rickey Lynn Hendricks, *A Model for National Healthcare: The History of Kaiser Permanente*, *Health and Medicine in American Society* (New Brunswick, N.J: Rutgers University Press, 1993), 65.

⁵ Paul Starr, *The Social Transformation of American Medicine* (New York: Basic Books, 1982), 325.

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- ⁶ Sally Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 1986, The Bancroft Library, Kaiser Permanente Medical Care Oral History Project, 171.
- ⁷ *Ibid.*, 171-172.
- ⁸ Sidney Garfield, "MHTS as an Entry to Health Care," in *Multiphasic Health Testing Services*, ed. Morris F. Collen, Biomedical Engineering and Health Systems (New York: Wiley, 1978), 452-453.
- ⁹ Martin Meeker, Gary Friedman, M.D.: Year 1 Theme: Evidence-Based Medicine, 2006, The Bancroft Library, Kaiser Permanente Medical Care Oral History Project II, 49-50.
- ¹⁰ Morris F. Collen, "History of MHTS," in *Multiphasic Health Testing Services*, ed. Morris F. Collen, Biomedical Engineering and Health Systems (New York: Wiley, 1978), 24-40.
- ¹¹ C. Kelly Canelo et al., "A Multiphasic Screening Survey in San Jose," *California Medicine* 71, no. 6 (December 1949): 409-13.
- ¹² Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 172-175.
- ¹³ Collen, "History of MHTS," 19.
- ¹⁴ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 183-184.
- ¹⁵ Amy L. Fairchild, "The Democratization of Privacy: Public-Health Surveillance and Changing Conceptions of Privacy in Twentieth-Century America," in *History and Health Policy in the United States: Putting the Past Back In*, ed. Rosemary A. Stevens, Charles E. Rosenberg, and Burns (New Brunswick, N.J: Rutgers University Press, 2006), 111-112.
- ¹⁶ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 175-178.
- ¹⁷ Collen, "History of MHTS," 18-23.
- ¹⁸ *Ibid.*, 19-20.
- ¹⁹ Morris F. Collen, *Detection and Prevention of Chronic Disease Utilizing Multiphasic Health Screening Techniques: Hearings Before the Subcommittee on Health of the Elderly of the Committee on Aging* (Washington, D.C., 1966), 3.
- ²⁰ Collen, "History of MHTS," 33.
- ²¹ Amy L. Fairchild et al., *Searching Eyes: Privacy, the State, and Disease Surveillance in America*, California/Milbank Books on Health and the Public 18 (Berkeley : New York: University of California Press ; Milbank Memorial Fund, 2007), 3-8.
- ²² Rickey Lynn Hendricks, *A Model for National Healthcare: The History of Kaiser Permanente*, Health and Medicine in American Society (New Brunswick, N.J: Rutgers University Press, 1993), 11-12.
- ²³ *Ibid.*, 12-13.
- ²⁴ Tom Debley and Jon Stewart, *The Story of Dr. Sidney R. Garfield: The Visionary Who Turned Sick Care into Health Care* (Oakland, Calif: Permanente Press, 2009), 11-16.
- ²⁵ Hendricks, *A Model for National Health Care*, 12-14.
- ²⁶ *Ibid.*, 27-29.
- ²⁷ *Ibid.*, 32-37.
- ²⁸ *Ibid.*, 33.
- ²⁹ John G Smillie, *Can Physicians Manage the Quality and Costs of Health Care?: The Story of the Permanente Medical Group* (New York: McGraw-Hill, 1991), 21-24.
- ³⁰ Hendricks, *A Model for National Health Care*, 27-28.
- ³¹ Smillie, *Can Physicians Manage the Quality and Costs of Health Care?*, 33-37.
- ³² Hendricks, *A Model for National Health Care*, 45-46.
- ³³ *Ibid.*, 49-56.
- ³⁴ *Ibid.*, 64-65.
- ³⁵ *Ibid.*, 70-76.
- ³⁶ Smillie, *Can Physicians Manage the Quality and Costs of Health Care?*, 73-78.
- ³⁷ Report, "The 'Permanente' Plan: It's Organizational Form," California Medical Association, February 1953, Carton 78, Folder 2, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.

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- ³⁸ For more information on the rise of Blue Cross/Blue Shield, see Starr, *The Social Transformation of American Medicine*, 295.
- ³⁹ Hoffman, *Health Care for Some*, 91.
- ⁴⁰ Starr, *The Social Transformation of American Medicine*, 290-293.
- ⁴¹ Starr, *The Social Transformation of American Medicine*, 328.
- ⁴² Hoffman, *Health Care for Some*, 98.
- ⁴³ Rosemary Stevens, *American Medicine and the Public Interest*, Updated ed., with a new introd (Berkeley: University of California Press, 1998), 271.
- ⁴⁴ Hoffman, *Health Care for Some*, 91.
- ⁴⁵ Stevens, *American Medicine and the Public Interest*, 419.
- ⁴⁶ In this evolving healthcare landscape, historian Rosemary Stevens argues, the hospital “gained power as the central focus for health services.” The shift towards hospital authority challenged the fee-for-service, independent physicians who had dominated American medicine since the early 1900s. To ensure that private practices could co-exist alongside hospitals and hospital insurance, the powerful American Medical Association (AMA) had suppressed two waves of calls for national health insurance.⁴⁶ The Permanente Foundation now disrupted this delicate balance. Stevens, *American Medicine and the Public Interest*, 421.
- ⁴⁷ Hendricks, *A Model for National Health Care*, 72-73.
- ⁴⁸ For more information on earlier attempts at group practice, see Hendricks’ discussion on the Ross-Loos Clinic. Hendricks, *A Model for National Health Care*, 17-18.
- ⁴⁹ Report, “The ‘Permanente’ Plan: It’s Organizational Form,” California Medical Association, February 1953, Carton 78, Folder 2, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁵⁰ *Ibid.*, 1.
- ⁵¹ Starr, *The Social Transformation of American Medicine*, 325-327.
- ⁵² *Ibid.*
- ⁵³ *Ibid.*
- ⁵⁴ Annual Report on Research and Medical Care Programs of the Permanente Foundation for 1944 and Forecast for 1945, January 1, 1945, Carton 272, Folder 11, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁵⁵ Annual Report on Research and Medical Care Programs of the Permanente Foundation for 1945 and Forecast for 1946, January 1, 1946, Carton 272, Folder 11, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁵⁶ Recommendations Concerning Policy for the Research Program of the Permanente Foundation, Carton 68, Folder 10, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁵⁷ Letter, Margaret D. West to Robert C. Elliott, January 14, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁵⁸ Letter, O.D. Cole to S.R. Garfield, February 26, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁵⁹ Scope of a Proposed Statistical Research Program for the Kaiser Foundation, February 24, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley, 1-7.
- ⁶⁰ Tentative Budget, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁶¹ Letter, Thomas McCarthy to Robert C. Elliot, March 6, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley, 1-2.
- ⁶² *Ibid.*, 2.
- ⁶³ Letter, Henry J. Kaiser to Mr. and Mrs. John D. West, April 23, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.

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- ⁶⁴ Arthur Weissman, "Illustrative Types of Statistical Information Which Might be Desired by Kaiser Foundation Medical Center Organization," March 4, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁶⁵ Arthur Weissman, "Functions of a Statistical Unit in Kaiser Foundation Medical Center Organization, March 4, 1953, Carton 81, Folder 6, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁶⁶ Daily Census: Walnut Creek Hospital, July-December 1953, Carton 81, Folder 13, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ⁶⁷ Fairchild et al., *Searching Eyes*, 1-2.
- ⁶⁸ *Ibid.*, 2-3.
- ⁶⁹ Jonathan Engel, *Poor People's Medicine: Medicaid and American Charity Care since 1965* (Durham: Duke University Press, 2006), 28-29.
- ⁷⁰ As Louis Pasteur and Robert Koch popularized the germ theory of disease, many physicians explored bacteriology because advances in the field had the potential to cure several diseases. For more information, see Fairchild et al., *Searching Eyes*, 3.
- ⁷¹ Fairchild, "The Democratization of Privacy: Public-Health Surveillance and Changing Conceptions of Privacy in Twentieth-Century America," 113-117.
- ⁷² Horace Dobell, *Lectures on the Germs and Vestiges of Disease: And on the Prevention of the Invasion and Fatality of Disease by Periodical Examinations; Delivered at the Royal Infirmary for Diseases of the Chest*. (John Churchill, 1861), 154.
- ⁷³ Starr, *The Social Transformation of American Medicine*, 193.
- ⁷⁴ *Ibid.*, 194.
- ⁷⁵ Collen, "History of MHTS", 3-4.
- ⁷⁶ Fairchild et al., *Searching Eyes*, 7-12.
- ⁷⁷ Lester Breslow, "An Historical Multiphasic Review Screening," *Preventive Medicine* 2, no. 2 (1973): 177-96.
- ⁷⁸ Collen, "History of MHTS," 4.
- ⁷⁹ Breslow exemplified the semipermeable barrier between physicians and public health. Wanting to pursue his interest in chronic disease epidemiology, he held multiple positions over the course of his career, including California State Director of Public Health, and later, the Dean of the University of California, Los Angeles School of Public Health. For more information on Lester Breslow, see JoAna Stallworth and Jeffrey L. Lennon, "An Interview with Dr. Lester Breslow," *American Journal of Public Health* 93, no. 11 (2003): 1803-5.
- ⁸⁰ Collen, "History of MHTS," 4-9.
- ⁸¹ Canelo et al., "A Multiphasic Screening Survey in San Jose," 409-413.
- ⁸² *Ibid.*, 411.
- ⁸³ *Ibid.*, 412-413.
- ⁸⁴ Hoffman, *Health Care for Some*, 111-112.
- ⁸⁵ Reflecting on the success of these preliminary trials in 1950, Breslow published a commentary on multiphasic screenings in the *American Journal of Public Health*, titled "Multiphasic Screening Examinations- An Extension of the Mass Screening Technique." Breslow contrasted multiphasic health screenings with traditional periodic examinations, noting that, "these screening procedures are capable of very wide application; they are relatively inexpensive per person tested....The screening procedures can be carried out by technicians. A physician is required only for rapid interpretation of certain test results and... spending time with the patient in diagnostic study" Lester Breslow, "Multiphasic Screening Examinations—An Extension of the Mass Screening Technique," *American Journal of Public Health* 40, no. 3 (1950): 274-78.
- ⁸⁶ Breslow was also excited by the tremendous potential of multiphasic health screenings to expand and incorporate new screening tests. In 1950, Breslow was well aware of the potential for multiphasic health screenings. In imagining these possibilities, he stated, "By combining tests for these several diseases, one

would expect to find, in a multiphasic screening of 1,000 persons, approximately 20 to 30 persons who have significant disease requiring the continuing attention of a physician. In addition, one can readily conceive of the incorporation of other tests into the battery; these might include hemoglobin determination, albumin test of the urine, blood pressure, weight, vision and audiometric testing. Breslow, "Multiphasic Screening Examinations—An Extension of the Mass Screening Technique," 276.

⁸⁷ Collen, "History of MHTS," 5-6.

⁸⁸ *Ibid.*, 6-9.

⁸⁹ For a discussion on national healthcare debates during the Truman presidency, see Starr, *The Social Transformation of American Medicine*, 280-286. Also see Stevens, *American Medicine and the Public Interest*, 272-274.

⁹⁰ Hoffman, *Health Care for Some*, 95.

⁹¹ *Ibid.*, 102-103.

⁹² *Ibid.*, 103.

⁹³ *Ibid.*, 104-105 .

⁹⁴ Starr, *The Social Transformation of American Medicine*, 325-327.

⁹⁵ Hoffman, *Health Care for Some*, 111.

⁹⁶ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 171-175.

⁹⁷ *Ibid.*, 1-5.

⁹⁸ Hendricks, *A Model for National Health Care*, 42.

⁹⁹ *Ibid.*, 70-71.

¹⁰⁰ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 171.

¹⁰¹ *Ibid.*, 172.

¹⁰² Collen, "History of MHTS," 7.

¹⁰³ Hendricks, *A Model for National Health Care*, 71-74.

¹⁰⁴ Collen, "History of MHTS," 7.

¹⁰⁵ E. Richard Weirner et al., "Multiphasic Screening of Longshoremen with Organized Medical Follow-Up," *American Journal of Public Health* 42 (December 1952): 1552-67.

¹⁰⁶ *Ibid.*, 1558.

¹⁰⁷ Reflecting on the project in 1973, Breslow credited its success to the ILWU for assuming a great deal of responsibility for planning the program and undertaking "an extensive educational campaign." Breslow, "An Historical Multiphasic Review Screening," 182.

¹⁰⁸ For an extended discussion on the differences between preventive and curative medicine in early twentieth-century America, see Starr, *The Social Transformation of American Medicine*, 196-197.

¹⁰⁹ Collen, "History of MHTS," 7.

¹¹⁰ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 172.

¹¹¹ Sidney Garfield, "Facilities Design and Construction," in *Multiphasic Health Testing Services*, ed. Morris F. Collen (New York: Wiley, 1978), 110-112.

¹¹² In sequential testing, patients specifically moved through two stages: a "dressed" stage that involved tests like visual acuity, and an "undressed" stage, separated by gender, for tests like x-rays and mammographies. Garfield, "Facilities Design and Construction," 110-111.

¹¹³ *Ibid.*, 111.

¹¹⁴ *Ibid.*, 112-113.

¹¹⁵ Report, "Innovations in New Kaiser Permanente Medical Centers", February 4, 1953, Carton 78, Folder 2, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley, 1.

¹¹⁶ *Ibid.*, 2.

¹¹⁷ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 173.

¹¹⁸ *Ibid.*, 174.

¹¹⁹ *Ibid.*, 173.

¹²⁰ Garfield, "MHTS as an Entry to Health Care," 465.

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- ¹²¹ Morris F. Collen and Corinne Linden, "Screening in a Group Practice Prepaid Medical Care Plan," *Journal of Chronic Diseases* 2, no. 4 (October 1955): 400–408.
- ¹²² Collen, Morris F, and Corinne Linden. 1955. "Screening in a Group Practice Prepaid Medical Care Plan," 400–408.
- ¹²³ Lester Breslow, "Multiphasic Screening in California," *Journal of Clinical Epidemiology* 2, no. 4 (October 1955): 375–83.
- ¹²⁴ Collen, "History of MHTS," 8.
- ¹²⁵ *Ibid.*
- ¹²⁶ "A Study of Multiple Screening- Descriptive Data on 33 Screening Surveys" (Chicago: American Medical Association, Council on Medical Service, 1955).
- ¹²⁷ Henrietta Herbolsheimer and Billie L. Ballard, "Multiple Screening in Evaluation of Entering College and University Students," *Journal of the American Medical Association* 166, no. 5 (February 1958): 444–453.
- ¹²⁸ Starr, *The Social Transformation of American Medicine*, 384.
- ¹²⁹ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 176.
- ¹³⁰ *Ibid.*, 177-178.
- ¹³¹ Morris F. Collen, "Concepts and Objectives," in *Multiphasic Health Testing Services*, ed. Morris F. Collen (New York: Wiley, 1978), 60.
- ¹³² Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 176.
- ¹³³ *Ibid.*, 174-177.
- ¹³⁴ Collen, "Concepts and Objectives," 58-60.
- ¹³⁵ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 177.
- ¹³⁶ Collen, "History of MHTS," 9-14.
- ¹³⁷ *Ibid.*, 9.
- ¹³⁸ *Ibid.*, 178.
- ¹³⁹ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 177.
- ¹⁴⁰ An early publication of Collen's methodologies in 1964 defined automated screening as "utilizing automated and semi-automated electronic and mechanical equipment to determine automatically whether there is sufficient likelihood of disease being present to warrant further specific diagnostic testing." For more information on Kaiser's MHTS research methodology, see Morris F. Collen et al., "Automated Multiphasic Screening and Diagnosis," *American Journal of Public Health and the Nations Health* 54, no. 5 (1964): 741–50.
- ¹⁴¹ Morris F. Collen et al., "Automated Multiphasic Screening and Diagnosis," 742.
- ¹⁴² *Ibid.*, 742-744.
- ¹⁴³ *Ibid.*, 743.
- ¹⁴⁴ "Kaiser Permanente Offering Speedy Physical Checkups," *Honolulu Advertiser*, December 12, 1968, Vol. 4, BANC MSS 87/131 p, Kaiser Foundation Hospitals, Hawaii Region Records, 1958-1988, Bancroft Library, University of California, Berkeley.
- ¹⁴⁵ Margaret Drossel, "Kaiser Plan Automates Multiphasic Testing," *Modern Hospital*, May 1966, 113-116.
- ¹⁴⁶ Collen, "History of MHTS," 19.
- ¹⁴⁷ For more information on the Kaiser Foundation's School of Nursing, see "The History of the Kaiser Foundation School of Nursing", March 23, 1961, Carton 272, Folder 13, BANC MSS 88/205 c, Henry J. Kaiser, Jr. papers, The Bancroft Library, University of California, Berkeley.
- ¹⁴⁸ Sidney Garfield, "MHTS as an Entry to Health Care," in *Multiphasic Health Testing Services*, ed. Morris F. Collen (New York: Wiley, 1978), 360.
- ¹⁴⁹ Collen, "History of MHTS," 26.
- ¹⁵⁰ *Ibid.*, 30-33.
- ¹⁵¹ Garfield, "Facilities Design and Construction," 105.
- ¹⁵² Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 176.

- ¹⁵³ When Kaiser's MHTS model expanded, bioengineers were still involved in developing interfacing equipment so all lab tests could automatically be punched and entered into computers. Even with this capacity, Kaiser never directly supported bioengineering beyond the immediate needs of MHTS during the program's first twenty years. Kaiser may have been quick to adopt new bioengineering instruments, but in sharp contrast to medical computing, its innovative practices in this field were largely insular and geared towards troubleshooting within its own multiphasic program. *Ibid.*, 175-185.
- ¹⁵⁴ Collen, *Detection and Prevention of Chronic Disease Utilizing Multiphasic Health Screening Techniques: Hearings Before the Subcommittee on Health of the Elderly of the Committee on Aging*, 214.
- ¹⁵⁵ Paul KJ Han. 15 November 1997. "Historical Changes in the Objectives of the Periodic Health Examination." <http://annals.org/article.aspx?articleid=710964>.
- ¹⁵⁶ Collen, "History of MHTS," 9-16.
- ¹⁵⁷ Collen, *Detection and Prevention of Chronic Disease Utilizing Multiphasic Health Screening Techniques: Hearings Before the Subcommittee on Health of the Elderly of the Committee on Aging*, 219-220.
- ¹⁵⁸ *Ibid.*, 218.
- ¹⁵⁹ *Ibid.*, 232.
- ¹⁶⁰ Collen, "History of MHTS," 20.
- ¹⁶¹ *Ibid.*
- ¹⁶² *Ibid.*, 20-22.
- ¹⁶³ Hoogendoorn, D. 1971. "A Visit to the Automated Multiphasic Screening Laboratory of the Kaiser Foundation Health Plan in Oakland, California." *Nederlands Tijdschrift Voor Geneeskunde* 115 (8): 336-339.
- ¹⁶⁴ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 195.
- ¹⁶⁵ As MHTS became more accepted in the medical community, quality control measures became increasingly relevant. In their 1978 book, *Multiphasic Health Testing Services*, Collen and his associates laid out a framework for quality control. Of premier importance was that: "The data on a multiphasic report belong to the patient whose name appears in the heading, that quantitative measurements (such as blood pressure and serum glucose) are accurate within a few percent, that qualitative results (such as x-ray and EKG interpretations) were made from the correct source documents... and that answers to personal and medical history questions were accurately recorded." Joseph F. Terdiman, "Quality Control," in *Multiphasic Health Testing Services*, ed. Morris Collen (Wiley, 1978), 242.
- ¹⁶⁶ If instruments produced erroneous results, the fast pace of sequential testing would result in numerous patients receiving inaccurate results before an error was detected. Furthermore, when multiphasic programs were first being incorporated into clinics, accuracy was essential in gaining the trust of physicians who had previously subscribed to traditional models of doctor-patient relationships and saw MHTS as a threat. For physicians' perceptions on MHTS, see Morris F. Collen, "Systems Evaluation of MHTS," in *Multiphasic Health Testing Services*, ed. Morris F. Collen (New York: Wiley, 1978).
- ¹⁶⁷ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 182.
- ¹⁶⁸ Sidney Garfield, "MHTS as an Entry to Health Care," in *Multiphasic Health Testing Services*, ed. Morris Collen (Wiley, 1978), 452-454.
- ¹⁶⁹ *Ibid.*, 454.
- ¹⁷⁰ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 185.
- ¹⁷¹ *Ibid.*, 182.
- ¹⁷² Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 183.
- ¹⁷³ F. Bobbie Collen, "Health Education as an Adjunct to MHTS," in *Multiphasic Health Testing Services*, ed. Morris Collen (Wiley, 1978), 370.
- ¹⁷⁴ *Ibid.*, 372-373.
- ¹⁷⁵ *Ibid.*, 375.
- ¹⁷⁶ *Ibid.*, 399.
- ¹⁷⁷ *Ibid.*, 381.

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- ¹⁷⁸ Garfield, "MHTS as an Entry to Health Care," 1978, 456-457.
- ¹⁷⁹ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 207.
- ¹⁸⁰ Garfield, "MHTS as an Entry to Health Care," 1978, 457-458.
- ¹⁸¹ Ibid., 460-463.
- ¹⁸² It should be noted that during this time period, wait times were decreasing on average as a whole, meaning that the baseline efficiency was also improving. Garfield, "MHTS as an Entry to Health Care," 1978, 463.
- ¹⁸³ Ibid.
- ¹⁸⁴ Ibid., 464-466.
- ¹⁸⁵ Ibid., 464.
- ¹⁸⁶ In total, MHTS only referred 8.9% of patients to a physician's department for specialty care. The remaining patients requiring specialty follow-ups were instead sent to specialized clinics or preventive maintenance clinics manned by non-physician healthcare staff. Ibid., 465.
- ¹⁸⁷ Sidney Garfield, "MHTS as an Entry to Health Care," in *Multiphasic Health Testing Services*, 458-469.
- ¹⁸⁸ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 207.
- ¹⁸⁹ Ibid., 207-209.
- ¹⁹⁰ Debley and Stewart, *The Story of Dr. Sidney R. Garfield*, 102-104.
- ¹⁹¹ Ibid., 104.
- ¹⁹² Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 208.
- ¹⁹³ Ibid., 207-208.
- ¹⁹⁴ Ibid., 185.
- ¹⁹⁵ Ibid., 184-185.
- ¹⁹⁶ Ibid., 186.
- ¹⁹⁷ In 1986, Collen reflected on changes within MMR, today known as the Division of Research. When asked why he thought the medical computing and medical systems research divisions were terminated, he responded, "Well, with my retirement, and when we closed down the prototype system in San Francisco, the organization decided to concentrate on administrative computing, that is, to satisfy the requirements for our health plan office and our administrative offices, since medical computing was more of a research and development program. I guess no one else, after my retirement, wanted to continue research and development in medical computing." Ibid., 185.
- ¹⁹⁸ While Collen hesitated to believe internal politics were involved in the decision, he did cite the increased economic competition of the 1980s forcing Kaiser to substantially curb risky innovation in favor of more stable programs. "Technology goes where the money is. You cannot get paid for a patient's record." Ibid., 186.
- ¹⁹⁹ According to Collen, multiphasic testing in its pure form never proliferated rapidly in the U.S. In large part, he attributed this to the fact that insuring agents did not reimburse for multiphasic checkups in the 1970s and 1980s. Without being paid for these services, most healthcare organizations (besides pre-paid HMOs) were unable to assemble funds for an initial investment in MHTS. Collen contrasted MHTS to CAT scans, which proliferated rapidly, because Blue Cross/Blue Shield and other indemnity insurers willingly paid the costs of these tests. Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 179.
- ²⁰⁰ Collen, "Systems Evaluation of MHTS," 488.
- ²⁰¹ Ibid., 180.
- ²⁰² Linking patients into care is especially difficult for diseases requiring long-term management, including HIV. For an example of Kaiser's modern approach to care linkage, see "Community-Based Organizations Remain Integral to Reduce HIV/AIDS Disparities," *Kaiser Permanente Center for Total Health*, November 30, 2015, <http://centerfortotalhealth.org/community-based-organizations-remain-integral-to-reduce-hiv-aids-disparities/>.
- ²⁰³ Hughes, Morris F. Collen, MD: History of the Kaiser Permanente Medical Care Program, 180.

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- ²⁰⁴ Collen, Morris F. 1969. "Cost Analysis of a Multiphasic Health Screening Program." *New England Journal of Medicine* 280 (19): 1043–45.
- ²⁰⁵ Collen, "Systems Evaluation of MHTS," 519–524.
- ²⁰⁶ *Ibid.*, 523.
- ²⁰⁷ *Ibid.*, 526.
- ²⁰⁸ *Ibid.*, 526–527.
- ²⁰⁹ *Ibid.*, 527.
- ²¹⁰ *Ibid.*, 527–528.
- ²¹¹ Gary D. Friedman, Morris F. Collen, and Bruce H. Fireman, "Multiphasic Health Checkup Evaluation: A 16-Year Follow-Up," *Journal of Chronic Diseases* 39, no. 6 (1985): 453–63.
- ²¹² Gary D. Friedman, "Effects of MHTS on Patients," in *Multiphasic Health Testing Services* (New York: Wiley, 1978), 539.
- ²¹³ Friedman, Collen, and Fireman, "Multiphasic Health Checkup Evaluation: A 16-Year Follow-Up," 455–459.
- ²¹⁴ Friedman, Collen, and Fireman also note the significance of self-selecting bias on their results. They emphasize that self-selection "played an important role in the inverse relation between number of MHCs and mortality, since at any given number of MHCs greater than zero, the control group had a substantially lower mortality rate than the study group. However, they emphasize that these results should not be "misinterpreted as showing that urging led the study group to have higher overall mortality rates than the control group." Rather, an individual in the control group who came in for MHCs would do so much more willingly than the urged study group. Consequently, "control-group subjects who had one MHC showed about as good a mortality experience as study-group subjects who had four or five MHCs." Friedman, Gary D., Morris F. Collen, and Bruce H. Fireman. 1986. *Ibid.*, 459.
- ²¹⁵ Meeker, Gary Friedman, M.D.: Year 1 Theme: Evidence-Based Medicine, 13–14.
- ²¹⁶ Friedman expanded upon this point, stating, "You can look at subgroups, and you find no finding in your whole over study, but if you keep dividing you may find something just by chance in one subgroup, and that seemed to be what happened." *Ibid.*, 39.
- ²¹⁷ *Ibid.*, 41.
- ²¹⁸ *Ibid.*, 38–39.
- ²¹⁹ *Ibid.*, 43.
- ²²⁰ Dr. Gary Friedman in discussion with Vivek Vishwanath, March 30, 2016.
- ²²¹ *Ibid.*
- ²²² *Ibid.*
- ²²³ Contemporary studies continue to struggle with defining the exact value of periodic health evaluations. For an example of this tension, see Hanna Bloomfield and Timothy Wilt, "Evidence Brief: Role of the Annual Comprehensive Physical Examination in the Asymptomatic Adult," Brief (Minneapolis: Evidence-Based Synthesis Program Center, Minneapolis VA Medical Center, October 2011) and LE Boulware et al., "Systematic Review: The Value of the Periodic Health Evaluation," *Annals of Internal Medicine* 146, no. 4 (February 20, 2007): 289–300.
- ²²⁴ "National Health Expenditure 2014 Highlights" (Center for Medicare and Medicaid Services, 2015), <https://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/NationalHealthExpendData/Downloads/highlights.pdf>.
- ²²⁵ "Home | PCMH Resource Center," *Agency for Health Research and Quality*, accessed April 3, 2016, <https://pcmh.ahrq.gov/>.

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Bibliographic Essay

In developing a topic for my thesis, I knew that I wanted to look critically at historical innovations in primary care. For years, I had anecdotally heard of Kaiser Permanente's success in developing integrated healthcare delivery models. Beyond these anecdotes, though, I had never been able to pinpoint strategies or initiatives Kaiser undertook to provide high quality primary care. My background research was very general to begin with, focusing almost exclusively on Kaiser Permanente's overall history and how it fit in to the healthcare landscape of the 1950s. I began by reading Rickey Hendricks' *A Model for National Healthcare*, which introduced me to some of the key actors in Kaiser's history, including Sidney Garfield and Morris Collen. The chapters on the health plan's wartime development and its expansion amidst the politics of national healthcare were particularly useful. As I delved further into Kaiser's expansion strategy, I was curious to know more about how its practice played into healthcare debates of the 1950s and the dominance of actors like Blue Cross/Blue Shield and commercial indemnity insurers. I turned to Beatrix Hoffman's *Health Care for Some* to understand this context, and was particularly interested in her classification of Kaiser Permanente as an alternative health plan. Hoping to identify particular initiatives that set Kaiser apart, I found John G. Smillie's *Can Physicians Control the Quality and Costs of Health Care?*, which introduced me to multiphasic health screenings. The idea that physicians could simultaneously be conducting operational research and administering care seemed highly innovative, and thus led me to delve further into Kaiser's research activities.

Originally, I was hoping to draw a strong connection between Kaiser's multiphasic health screening programs and the contemporary Patient Centered Medical Home (PCMH), a team-based primary care delivery model. I began examining primary source literature by visiting the Bancroft Library at UC Berkeley in October 2015. Two collections were of particular interest to me: the Henry J. Kaiser, Jr. Papers (from 1937-1961) and the Kaiser Foundation Hospitals, Hawaii Region records (from 1958-1988). I found the Henry J. Kaiser papers to be an eclectic collection of archival material, consisting of various internal correspondences between Kaiser and his chief medical officers, policy recommendations

for research programs, internal publications detailing the history of a Kaiser-supported nursing school, organizational structure diagrams, daily census data from hospitals in Walnut Creek, CA, and annual reports on Kaiser Permanente's research operations. I found a series of 1953 correspondences between Henry Kaiser and statistical consultants John and Margaret West to be particularly interesting. Supplemental letters between Kaiser and his advisers, including Robert C. Elliot and attorney Thomas McCarthy, also provided a glimpse into Kaiser's research mentality. While the statistical program proposed by the Wests never came to fruition, their 1953 proposal, titled "Scope of a Proposed Statistical Research Program for the Kaiser Foundation," was an early example of the Permanente Health Plan trying to integrate research into practice. During my time at the archive, I also explored a document titled, "Innovations in New Kaiser Foundation Medical Centers" and the California Medical Association's 1953 report, "The Permanente Health Plan: Its Organizational Form." These pieces provided insight into Kaiser's overall administrative structure, and its strategies for expansion along the West Coast.

The second collection I reviewed at the Bancroft Library consisted of a series of newspaper articles collected between 1958 and 1988 detailing Kaiser's activities in Hawaii. I found several newspaper articles detailing concerns surrounding the rise of healthcare costs, but more interestingly, found a newspaper article in the December 12, 1968 Honolulu Advertiser that explained multiphasic health checkups to the general public. Around this time, I also found two other significant primary sources. The first was a 1966 article by journalist Margaret Drossel for the industrial magazine, Modern Hospital, and the second was testimony Dr. Morris Collen provided in front of the Senate Committee on Aging in 1966. All of these sources provided different perspectives on how Kaiser's multiphasic health screening programs were reaching a broad range of audiences, from medical academics to government officials and the general public.

Returning to Yale, I now hoped to delve into the actual details of how Kaiser developed its multiphasic health screening program by examining the key actors involved. Having come across Dr. Morris Collen's name in a few different sources, I began by examining two interviews he gave (in 1986

and 2005) as part of the Kaiser Permanente Medical Care oral history Project. During this time, I also read Jon Stewart and Tom Debley's book on Sidney Garfield, "The Story of Dr. Sidney R. Garfield: The Visionary Who turned Sick Care into Health Care." Collen's interviews were incredibly rich in detail and described the Kaiser vision for primary care between 1948 and 1973. However, it is important to note the retrospective bias in Collen's memory. All the interviews I examined took place after my period of study, and thus must be read with a critical lens.

Beginning with Lester Breslow's 1948 multiphasic health pilots in San Jose, Collen describes how he and Breslow formed a partnership between the U.S. Public Health Service and Kaiser Permanente. Discovering this partnership dramatically shifted the direction of my thesis, as I came to fully appreciate how novel it was for public health and medicine to be integrated under multiphasic health screening pilots. By 1951, Kaiser had launched its own multiphasic health screening programs within its medical center, and Collen's interviews go on to describe how the program transitioned from a manual to automated phase in the next twenty years. By the late 1970s, Kaiser had internalized a research to practice ideology, which became another central point in my thesis. Aiming to directly apply their research findings to improving the quality of care, Kaiser's physicians saw multiphasic health screenings as a means of streamlining clinic workflows and improving patient outcomes. Technological advancements during this time period were also critical, and Kaiser's willingness to adopt and tinker with technology made them pioneers in medical computing during this unprecedented period of innovation.

By the early 1970s, Kaiser was touting a medical care delivery system that also pushed physicians beyond the medical domain, to explore socio-economic determinants of health. However, when a 1973 recession hit, Kaiser's research division lost a significant amount of funding, and any explorations of new applications for medical computing quickly came to an end. Collen's interviews and Stewart and Debley's book on Garfield both reveal how unique and liminal this 25-year period was. Meanwhile, I had struggled to create a direct link between Kaiser's multiphasic health pilots and the modern PCMH model.

Thus, given the intense innovative nature of the time period I describe above, I decided to instead focus my thesis on Kaiser's multiphasic operations between 1948 and 1973.

As I examined Collen's interviews, and later interviews conducted by a second generation of physicians (like Dr. Gary Friedman), I also read the corresponding academic publications they mentioned. I was impressed by the vast body of literature on multiphasic health screenings, but it took time to piece together their impact and chronology. At this juncture, I also was fortunate to find a 1978 book Collen and his associates had published, aptly titled, "Multiphasic Health Testing Services" (MHTS). This work served as an encyclopedia of sorts, detailing MHTS' history, and a variety of different elements to consider in planning for a new program. Select chapters, like Bobbie Collen's "Health Education as an Adjunct to MHTS," Garfield's "MHTS as an Entry to Health Care", and Morris Collen's "Systems Evaluation of MHTS" were of particular interest to me, as they demonstrated how multiphasic health testing changed Kaiser's overall view on the role of a primary care physician in preventative medicine.

If the role of the physician was changing at Kaiser, I wanted to be able to analyze evaluations of this process. I first began by looking for cost-effective analyses, and found many publications between the 1950s and early 1980s. I next turned to a more difficult question. How effective were multiphasic health screenings in improving patient outcomes? There seemed to be a dearth of primary sources addressing this area of study, though I was able to gain some information by reviewing Dr. Friedman's interviews, and a study Collen and Friedman jointly published in the 1986 *Journal of Chronic Diseases*, titled "Multiphasic Health Checkup Evaluation: a 16-year follow up." While it seems that the value of multiphasic health screenings remains controversial, Kaiser's multiphasic programs influenced much more than care delivery. Having fleshed out my understanding of multiphasic health testing's timeline at Kaiser, I was able to identify two major transformations brought about by Collen's implementation of multiphasic health programs. Firstly, the program provided a research to practice framework that continued to influence Kaiser's care delivery model until 1973. Kaiser was constantly reconfiguring its practice during this period of time. Secondly, multiphasic health screenings represented an early major

collaboration between public health officials and physicians. MHTS broke down artificial barriers between these two fields, and encouraged a greater level of physician collaboration in maintaining long-term population health.

To supplement this extensive primary source collection, I turned to secondary sources like Rosemary Stevens' *American Medicine and the Public Interest*, and Paul Starr's *The Social Transformation of American Medicine*. I found both of these sources much later in my research process, but they proved critical to framing Kaiser's innovative strategies within the context of the brutally competitive healthcare landscape in the 1950s. I also made use of two publications Amy Fairchild wrote on the history of surveillance: a book titled, *Searching Eyes: Privacy, the State, and Disease Surveillance in America*; and a chapter she contributed to the book, *Putting the Past Back In: History and Health Policy in the United States*. Both sources helped me put Kaiser's screening programs in the context of a much longer history of public health surveillance. They also bolstered my argument that Kaiser's multiphasic health testing services were a novel example of a collaboration between physicians and public health officials.

While my paper benefited from the vast material available on Kaiser's multiphasic health testing programs between 1940 and 1980, it was difficult to directly link these programs to modern care delivery. It seems that the tenants of MHTS have largely been incorporated into new diagnostic methodologies at Kaiser, though this process has not been well documented. Fortunately, I had an unexpected stroke of luck. A few weeks ago, I had written to Dr. Gary Friedman, one of the few surviving contributors to multiphasic exams, asking about the lasting implications of MHTS at Kaiser. He wrote back suggesting I look at a few sources, but then, a couple weeks later, serendipitously called me. We spoke for about 40 minutes by phone, in which he gave me his opinions on Morris Collen, MHTS, and Kaiser's continued epidemiological studies with multiphasic databases. Speaking with Dr. Friedman was intensely gratifying, as he confirmed many of the accounts I had encountered in my research, and was happy to hear that his

oral interviews were contributing to historical scholarship. I also agreed to send him a copy of my thesis after it was done.

There are many avenues for building on this research. Further scholarship could explore the lasting implications of Kaiser's multiphasic health screening programs by speaking with patients who went through the battery of tests, and other physicians like Dr. Art Klatsky, who retrospectively analyzed multiphasic health data for further epidemiological studies. It would also be interesting to examine Kaiser's contemporaries; that is, other organizations or individuals who piloted their own preventative care programs. Given the limited time and space I had, however, I found it most suiting to focus on the time period between 1948 and 1973, when Kaiser's Department of Medical Methods Research pushed the boundaries of medical computing to streamline its operations, reform its care delivery model, and contribute meaningfully to public health. Kaiser continues as a dominant player in the contemporary healthcare space, and I hope my research can be expanded upon to better understand its more recent contributions to primary care in the 21st century.