Chapter 1

The Evolution of the CMIO in America

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The CMIO position is one of the newest executive positions in American healthcare. The creation of this role can be understood as a maturing of the healthcare industry in the United States, especially in the application of IT in the practice of medicine.

Although the term CMIO was not widely used until the late 1990s, and most institutions did not formally appoint anyone to such a post until early 2000, some physicians were performing this role in the 1970s and 1980s, and even in the 1960s. This chapter focuses on those individuals, some of whom are identified, and others who are more generally described, as they wish to remain anonymous. Some institutions achieved success in relying on such talents. Others took them for granted, and suffered a series of failures after driving them away. We cite those examples with which we are most familiar; there are numerous others who could

be discussed, but we lack the knowledge and space to do so here.

Those who have practiced the CMIO role have depended heavily on the historic development of clinical informatics as a discipline by such renowned individuals as Lawrence L. Weed, MD, at the University of Vermont in Burlington, who conceived of the problem-oriented medical record, a way of looking at medical information that has provided the underpinnings for all of our work in electronic medical records (EMRs). Similarly, Octo Barnett, MD, and his team at Massachusetts General Hospital (MGH) in Boston had the brilliant insight to understand that medical data had unique characteristics and to conceive the MUMPS (Massachusetts General Hospital Utility Multi-programming System) database structure, alternatively known as M, and related tools (sometimes called associative databases), which have served as the underpinnings for the most successful and widely deployed large-scale medical software programs, such as Veterans Administration's Decentralized Hospital Computer Program (DHCP), Veterans Health Information Systems and Technology Architecture (VistA), EPIC, Sunquest, Medical Information Technology (Meditech), and many others. The most widely installed and successful EMR system in the United States, EPIC, is built on associative database architecture, as it the most long-lasting governmental system, VA's VISTA. Donald W. Simborg, MD, of the University of California at San Francisco, envisioned the need for peer-based communications protocols such as Health Level 7 (HL7), and built early tools to support hospital-wide communication. Roger A. Cote, MD, DSc (Hon), with the SNOMED Committee, developed multiple editions of the Systematized Nomenclature of Medicine beginning in 1976. Thirty years later, this was amalgamated with the British READ codes, and is now SNOMED-CT, the worldwide lingua franca of medical information. Clem McDonald, MD, led the development of real-world interoperability, through protocols (lab communications),

semantics (the Logical Observation Identifiers Names and Codes [LOINC] database and universal standard), and reality (the Indiana Health Information Network). We could list dozens more. But these are the subject pioneers—the CMIOs who have created or taken these tools and made them real in their own institutions.

The earliest creation of an organization-wide EMR system was a 1968–1972 experiment funded by the U.S. Department of Health, Education, and Welfare—a collaboration between the Lockheed Corporation, many of whose engineers and programmers had created the U.S. Gemini space program—and El Camino Hospital in Mountain View, CA. Particularly important to the implementation of this EMR tool at El Camino was Dr. Ralph Watson, who truly embodied the position of CMIO decades before anyone used the term.

In order to better understand how physicians, nurses, and others in healthcare were actually using the medical chart and communications tools, a young hospital administrator, Richard L. Rydell, MBA, set up super-eight movie film with a time code at a busy nursing station at El Camino Hospital. With time-lapse recordings, this pioneer was able to discover what clinicians' communications entailed in the daily process of care and, importantly, how long they took in each of the activities. In retrospect, it is remarkable to realize that they were focused on the improvement of the process of workflow and provider communications, which remains to this day one of the most elusive aspects of EMR implementation.

Although the Lockheed (later Technicon) system implemented in El Camino was implemented in several other hospitals over the next two decades (including the Clinical Centers of the National Institutes of Health [NIH]), the time wasn't yet ripe for the widespread deployment of clinical information systems (CISs).

Another example of physician leadership of hospital informatics unfolded beginning in 1980, when a hospital-based physician arrived at a respected 400-bed community hospital

in a coastal California community, and began functioning as CMIO (without that formal title). He immediately tackled the challenge of bringing the hospital from a punch-card-based Burroughs billing system (the only computer in the hospital) to an array of badly needed clinical and ancillary systems. Interestingly, his medical and residency training had included mentoring by Drs. Roger Cote, Octo Barnett, and Don Simborg, and his early practice was influenced by the work of Dr. Clem McDonald, such that he had an uncommonly deep knowledge of clinical informatics. Beginning in 1980, he organized site visits, and encouraged system evaluations. From 1983 to 1985, he guided the technical and clinical staff of the hospital to selection and installation of several clinical information systems, including laboratory, radiology, pharmacy, and patient care/clinical. By 1985, the hospital was nationally recognized for the excellence of its array of clinical information systems. Baxter Corporation pointed out to hospital administrators that the hospital now had the most complete clinical implementation of the Dynamic Control/Delta order entry/results reporting system in the United States. Unfortunately, hospital administration repeatedly refused to reflect any compensation for the time of their de facto CMIO in their regular (management-fee) payments to his medical group. Although his partners made it clear that they couldn't continue to permit him to work on tasks "that we are not being paid for," hospital administration obstinately refused to designate a portion of that payment for clinical informatics, steadfastly insisting that it wasn't necessary to pay, and they weren't required to pay for informatics services.

Subsequently, the physician moved his practice to another city. The community hospital, lacking physician informatics guidance, went on to purchase a costly and disastrous failure of a system for physician outreach. A few years later, the hospital was a major participant in one of the most notable and spectacular regional health information organization (RHIO) failures on record.

Decades later, the hospital has recognized that physician informatics expertise is valuable, and they have begun paying a medical staff member as CMIO.

A year after leaving the community hospital, this informaticist realized that a major factor in the hospital's failure to consider payment was that informatics was not an ABMS-recognized (and therefore reimbursable) specialty. He presented the need of certification in clinical informatics as a medical specialty to the American Board of Pathology (ABP), and in 1991 the ABP proposed to the American Board of Medical Specialties that a Speciality Certification in Clinical Informatics be established.[1] The ABP then appointed a test committee to create a certification examination. This task proved exceedingly difficult, and it was not until 2005, when other specialities of medicine joined the work of defining the scope and creating the questions that the exam began to take shape. The first certification examination in clinical informatics was administered in 2013, and has been administered yearly since then. Practitioners who can show experience in clinical informatics will be grandfathered into be exam-eligible for a few more years. The primary mode of certification will be via a 2-year ACGME-approved fellowship.

Fortunately, other community hospitals took an opposite approach. In 1982, Bill Bria, MD, a pulmonary specialist who had trained at MGH, joined the pulmonary division at Baystate Medical Center in Springfield, MA. Finding that the mainframe computer used there was useless—five years after implementation, its only clinical function was to order chest x-rays—Bria introduced the subject of its inefficiency, with indignation, at a medical staff meeting, putting into motion the dynamic that when one brings up issues, he or she is then charged with finding the solution.

News of his criticism reached the new Chief Information Officer (CIO) at Baystate, Richard Rydell, who also learned of Bria's (successful) Apple II programming course for physicians. At their first meeting, Rydell's opener to Bria was "Would you

like to do something about the problem you've identified, or do you want to just continue to complain?"

After consultation with the Chief of Staff and Chief of Pulmonary, Bria accepted Rydell's challenge to dedicate 25 percent of his work time and salary in order to take on the challenge as a physician champion in the information services department. Within a year, this dedicated time increased to 50 percent, and under Rydell's direction, Bria traveled throughout the United States, speaking about and beginning to understand what this task was really about.

Needless to say, Baystate has had far greater and sustained success than the shortsighted hospital discussed in the previous example.

1n 1990, the Chief Executive Officer (CEO) of Long Beach Memorial Medical Center (Long Beach, CA) had decided to bring in the Technicon system (described earlier) because of its emphasis on the value of direct physician order entry (a dozen years before this became fashionable). He brought in Rich Rydell as CIO, because of Mr. Rydell's experience in that deployment, who in turn identified a highly respected member of the medical staff, Harris Stutman, MD, to serve as CMIO (although the term wasn't in use at that time). Additional physicians were recruited, all on a part-time basis (including the informaticist from the first hospital above), and within a few years the hospital had launched TDS7000, with a rate of computerized physician order entry (CPOE) as high as 80 percent in some specialties.

There are a number of examples of academics heavily involved in medical informatics in the 1970s and 1980s. In a few cases, they functioned as CMIOs, guiding hospital efforts in systems deployment, and in other instances, they focused on research and had little or no contact with the clinical side.

Most notable are those who stepped forward and developed clinical systems that became the core applications in their academic medical centers. One of the first was Octo Barnett, MD, founder and Senior Scientific Director

of the Laboratory for Computer Science for over 40 years (retired in 2012). As mentioned earlier, his most far-reaching innovation was to lead the invention in the late 1960s of the MUMPS programming language, which was used to create a clinical laboratory information system, a radiology system, a medication ordering system (decades before its time), a surgical pathology system (that served as a prototype for many of the systems popular today),[2] a Computer Stored Ambulatory Record (precursor of today's EHRs), and many other clinically relevant tools.

At Indiana University's Regenstrief Institute, Clem McDonald, MD, and his team began creating the EHR tool that became the core application for the Wishard Hospital and many other applications. An even more important part of Dr. McDonald's role was in his creation and championing of standards crucial for our interconnected world—the ASTM/HL7 (American Society for Testing and Materials and Health Level 7) standard for reporting observations, and the LOINC standard for naming lab results. Since 2007, he has been leading the Lister Hill Center of the National Library of Medicine.

At the University of Utah LDS Hospital, Homer Warner, MD, PhD, and his team built a series of clinical tools, encapsulated in the HELP system, that became the beacon for such understanding (and application) as how to improve patient outcomes with informatics tools. In the early 1970s, they also constructed the Medlab laboratory information system, one of the first widely installed (and highly functional) laboratory information systems. Unfortunately, the adage that "a prophet is without honor only in his own country" applied to that team. For all the success they had at LDS Hospital (and subsequently at Intermountain Health Care), their opinions and guidance were often disregarded at the "official" University Hospital across town.

At another Harvard Hospital, Beth Israel, Warner Slack and Howard Bleich, both MDs, led their team to create a complete

suite of clinical applications, initially deployed in the early 1980s and still in use today. These served as models for the clinical applications subsequently developed at Brigham and Women's Hospital that served for some years as the primary system for Partner's Healthcare.

In 1976, the University of California, San Francisco (UCSF) hired Donald W. Simborg, MD, as their CIO. Not only was it highly unusual to hire a physician for such a post, but this appointment occurred in what proved to be a highly propitious time. Dr. Simborg proceeded to develop a series of applications for important clinical functions (such as patient master index, surgical pathology, etc.) but also came to recognize the most fundamental needs for technical interoperability. It was out of this experience that he founded Simborg Systems and developed the first set of tools to freely interchange clinical data among disparate systems. Simborg's experience was one of the most important factors leading to the creation of the HL7 data interchange standard. In this instance, not only did Dr. Simborg's contributions benefit the patients at UCSF, but UCSF contributed to all of our ability to interchange clinical data.

So, several academic informatics programs became involved clinically, or built applications that became core to their medical center, while others remained preoccupied with academic research projects and largely oblivious to the mission of the medical center they inhabited. To differentiate these two tendencies, one need only consider how many applications developed by that group are being widely applied for patient care in their own institution, or in others.

In other academic institutions, physicians sometimes took the lead in acquiring and implementing commercial systems. One of the most notable was Mel Bernstein, MD's comprehensive installation of Meditech applications in 1980 at the University of British Columbia at Vancouver. Dr. Bernstein's vision of an integrated solution serving multiple departments off a single database was an inspiration to many.

Several physicians have assumed key roles in the development of the Veterans Administration's (VA) Decentralized Hospital Computer Program (DHCP), referred to earlier, which evolved to the VistA system. This was for several years generally recognized as the most comprehensive and effective medical information system in the United States.

The history of the evolution of the CMIO in the United States is largely a matter of oral tradition. And in recognizing this, we would be delighted if readers would contribute to us the stories of others who were early pioneers in demonstrating the value of physicians guiding the clinical information strategy of medical centers.

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