

Denis Protti's professional memoirs

50 years (1967-2017) in the use of computer technology in medicine and health care – long before it was called Health Informatics or Digital Health

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Preface

This work started out to be a history of health/medical computing/information technology in Canada. I had made a note to that effect in my 'Papers to Write' file before I retired from teaching at the University of Victoria in 2010. For a variety of reasons, I never got around to it until November 2019; I decided then that it should get it done while I was still reasonably compos mentis.

Where do we start and how should it be organized? In 2012, I had finished writing my personal memoirs, which included a section on my professional working life. That document had been written for our children and grandchildren. It was a synopsis of my life including what I did for a living for over 50 years. That document was the starting point for this paper.

As more technical and scientific information were inserted, this work started to move beyond simply being a history of what happened in Canada. It was becoming a personal account of my professional career which started in the Medical College in Winnipeg in 1967 and ended with my 'fully retiring' from writing and consulting in Victoria in 2017. As it grew in that direction, I was becoming increasingly uncomfortable with the frequent use of the word "I" which I felt was being too boastful. In trying to capture my career, and what was going on at each stage of it, I tried to tone down my attainments. After consulting with a few close colleagues and friends, including my bride of some 55 years, I was encouraged to keep the paper as it was and to consider it as a professional autobiography. It was suggested that I add in even more personal anecdotes and to consider it as an extension of the personal memoirs that I had already written. My dear wife also reminded me that several of my colleagues had been encouraging me for years to get this written.

So, dear readers, here is an account of what I did professionally for some 50 years. It captures not only a brief history of the field of Health Informatics in Canada and abroad, but it also reveals the small part I played in its growth and development. I include many names of people who encouraged, influenced, supported, helped, and mentored me; they played a significant part in my working and personal life. Those who are still alive filled in my numerous memory gaps -- events and facts that I had totally forgotten; a good memory is not one of my gifts. I apologize and seek forgiveness for those who should have been included.

Please note that my dear wife Pat is mentioned on a few occasions. I should have done it more often. Without her untiring support and assistance, I would not have realized what I did over these many years. I dedicated my Masters thesis to her in 1972 and I now dedicate this work to her as well.

Origins of my career

When I graduated from the University of Alberta in Edmonton with a degree in Mathematics in April 1965, I had five job offers - all because I knew how to program a computer in the scientific-oriented FORTRAN language. In those days, two university computer science courses (using an IBM 7040 which had only been installed at the University in 1964), in the eyes of many, made you an expert. My first job was writing seismic oil exploration programs at Shell

Oil in Calgary. I only worked Monday – Friday from 8:30 – 4:30, never working in the evenings or on weekends – that came later in my career. Little did I know at the time that a career in Health Informatics (what is now referred to in some circles as Digital Health) lay ahead.

Data processing, as it was then called, was reasonably viable and somewhat safe in the financial arena, performing repetitive and mundane tasks such as payroll, accounts receivable, and later accounts payable and general ledger. Shell Oil had only started to use computers in a scientific domain such as oil exploration in 1963.

In those early days, automation was a cumbersome process. The data from source documents were “punched” onto cards by keypunch card operators. The dwindling number of us “old-timers” still around have memories of lugging racks of 80 column cards to the sorter so that six hours later, after numerous sorts and re-sorts, documents such as payroll cheques or reports could be printed by department in alphabetical sequence. A typical payroll for 2,000 employees in the sixties took some 6-8 hours to run if conditions were optimal and the programming was effective.

The investment was huge, the equipment fragile, and technical resources scarce. The “Data Processing Centre” was hallowed ground. It was essentially a hermetically sealed room with its own air conditioning and humidity control complete with a sub-floor for cables and a protected power source. As my dear departed friend Steve Huesing was fond of saying, “a Temple that only the ordained could enter”.

The well-known – at least back then – organizational theory academic Robert Townsend wrote that the priests were commonly referred to as “propeller heads”; to my friend and colleague, Karen Ondo, they were ‘bit twiddlers who wore wing tip shoes’. An amalgam of today’s programmer, analyst, data base administrator, systems engineer, they were umbilically attached to their brand of computer and fanatically devoted to the programming language on which they were nurtured. By way of explanation, at the time that was a virtual necessity - a good programmer had to make judicious use of every single byte of memory, as there was not very much of it to go around. They were analogous to mechanics trying to squeeze an additional mile an hour out a four-cylinder engine.

As Steve Huesing wrote in the 2005 publication “*From Mainframe to Mainstream: The Evolution of COACH and Health Informatics in Canada*”, by today’s standards, where computer horsepower is measured in terabytes and speed in nanoseconds, the term “puppy-power” comes to mind. Main computer memory was measured in “K” and storage in similar quantity. That publication also provides some of the history of our field. It also documents the computer vendors (see how few of them still exist today), the central provincial service bureaus, and some of the challenges of computing in Canada during the period 1970-2005. It should be noted that in 2017, the COACH organization (more about it later) became Digital Health Canada.

It became apparent that to progress at Shell Oil holding a master’s degree would help. Responding to an ad in the newspaper, I went to an interview in a Calgary hotel where Dr. Bernie Hodson convinced me to move to Winnipeg. The huge attraction was being able to work as a computer programmer in the Computer Centre of the University of Manitoba while being given time off to take daytime courses towards a master’s degree in Computer Science. I could

make up the time in the evenings and on weekends as well as earn a reasonable wage to support a family. We thought that we would be gone for only two years or so and then move back to Shell Oil in Calgary. Little did we know that two years would become twelve years.

Our move to Winnipeg

We made our move from Calgary to Winnipeg in 1967 which feels such a long time ago. That was the year that Canada had a year-long celebration of the 100th anniversary of the BNA Act of 1867; the 1st Boeing 737 rolled out; "O Canada" became our national anthem; and believe it or not, the Toronto Maple Leafs won the Stanley Cup!

We arrived in Winnipeg on April 2nd, 1967, after a harrowing trip from Calgary. We got caught in a snowstorm and were stranded on the highway outside of Moose Jaw, Saskatchewan, for six hours – and my lovely wife was five months pregnant with our first child. I went to work right away in the computer centre of the University of Manitoba on the campus in Fort Garry. After a few weeks Dr. Hodson asked me if I would like to work at the Medical College which was downtown. He said it had been decided to put an RJE (remote job entry) terminal in the basement of the Medical College so that the researchers from Medicine and Dentistry could have their punched cards read there and the data transmitted to the university computer over the telephone line; the computer outputs would then be sent back to the Medical College RJE terminal to be printed. The research staff would no longer have to drive thirteen kilometers to the campus with their boxes of cards and sit around for hours and wait for their printouts.

I was a young 23-year-old and somewhat naïve. Dr. Hodson told me that that I would no longer work for the Computer Centre but would be employed by the Medical College. To his credit, Dr. Hodson warned me that it would likely take me more than two years to finish my degree. I finally did get my Master of Science degree in Computer Science in April 1971. Having taken all my course work since arriving in 1967, the University compelled me to write my thesis or start all over again due to a five-year time limit. My thesis was based on my work at the Medical College and was titled "The Implementation of Computing Services in a Medical Research Environment".

In December 2009, out of the blue, Bernie Hodson contacted me; he wanted me to write something for the University of Manitoba archives. During our conversations, he told me that *"For the record your original hiring was for the Medical College, but I had to make sure it was in good hands; I daren't have someone there with whom I had any doubts"*. I have been very fortunate to have had a very fulfilling career -- thanks in no small part to people such as Bernie Hodson. Little did I know that when he hired me for the Medical College that I would become the Godfather of Canadian Health Informatics (a term that some have used to call me). As Dr. Michael Guerriere pointed out, it is always amazing that a small, seemingly inconsequential event or meeting can set the course of one's career! Upon reflection, I can honestly attribute my moderate successes to having started with Dr. Hodson; had he not encouraged me to leave the Computer Centre and move to the Medical College, I would not have followed the path that I did.

When I went over to the Medical College, I began to ponder about when computer technology in medicine had begun. I did not yet have an appreciation that medicine was the integral part, but only a part, of health care delivery systems. I had learned a bit about the history of computers while at University but not anything about their application in the medical field. What were our origins?

For those readers who are primarily interested in the history of the discipline/field of Health/Medical Informatics, the Appendix covers the subject with a bit of detail going back to the early sixties. It identifies who the early North American and European pioneers were both in terms of individuals as well as organizations. It also includes a short discourse on the challenges we faced in terms of constantly changing terms we used in the field.

University of Manitoba, Medical College (1967 - 1972)

The Medical College was in the centre of Winnipeg, 6 miles away from the U of M campus in Fort Garry. My first meeting at the Medical College was with the Dean, Dr. Arnold Naimark, and Dr. Michael Saunders, who was the head of the EEG department at the Medical College and at the Winnipeg General Hospital. My first title was Systems Analyst; by 1970 my title was Assistant Director.

Dr. Saunders had been chosen to be the Director of the Computer Department for Health Sciences (CDHS) – the first of its kind in Canada. He had written a paper in the June-July 1966 issue of the Canadian Medical Association Journal about computer usage in medicine. In it he stressed the importance of the human-human interplays being mixed with human-technology ones that occur in medicine and how they differed from many commercial and industrial applications. Little did our field, let alone me, appreciate this kind of thinking at the time. Over the years I experienced that reality in 1982 when Al Haskell from the University of Alberta Hospital and I presented a paper "Managing Information in Hospitals: 60% Social, 40% Technical", at the International Medical Informatics Association (IMIA) Working Conference on Trends in Hospital Information Systems. Yes, I got the percentages wrong; human factors usually account for more than 60% of the challenges 😊. I was hammered in the question period that the issues we faced were algorithmic, mathematical and technical and that human factors were not worth spending time on. The importance of human factors and the interactions with technology, let alone the impacts on patient safety, was not widely recognized in our field at the time. It took those of us from this school of thinking -- led by Dr. Nancy Lorenzi amongst others -- many years to finally get our international body the (IMIA) to create a Working Group on Organizational and Social Issues.

Dr. Saunders became my first mentor; the first of many cherished mentors. He was a wonderful Yorkshireman who sent me to scientific conferences to get exposed to what was happening elsewhere. I can recall going to gatherings Houston and New Orleans. I also remember the roughest flight of my life flying on an old turboprop Lockheed Electra along the Rockies from Calgary to Denver.

Dr. Saunders once told me that we would not see a quantum change in the use of computer technology in medicine and health care until we saw a change in the power structure of the

medical schools. He was responding to my bemoaning that we were progressing too slowly. His prophecy was correct; many decades later a small piece of research revealed that little to no informatics was being taught in our Canadian medical schools. The challenge of course was what would be removed if informatics were to be inserted in the curriculum.

The Computer Department for Health Sciences

As noted above, my first task at CDHS was to help install an IBM Remote Job Entry (RJE) terminal in the Medical College. The IBM 2780 RJE, first shipped in 1967, came in four models. We installed one of the first models which could “read” punched cards and transmit the data to a remote host computer and print outputs sent back by the host. The 2780 used a dedicated telephone line at speeds of 1200 - 4800 bits per second. The card reader unit could read up to 400 cards per minute; the line printer could print up to 240 lines per minute. The blank cards onto which holes were punched were in my wheelhouse; my most lucrative summer job was in working in an IBM plant in Edmonton producing thousands of boxes of blank cards in 1962 & 63.

We were told that we were one of the 1st non-military sites in North America to transmit digital data over analog telephone lines! I do vividly remember the day in 1967 when MTS (Manitoba Telephone System) brought in 10-15 men to our computer room in the basement of the Medical College on McDermott Avenue to see the new device that could send digital data over the phone lines (which until then only transmitted analog data). This was a first for Manitoba and perhaps even Canada.

Those were also the very early days of telecommunications from computer terminals (actually teletype machines) to mainframe computers. We would get “online” by putting a phone handset on the teletype machine into a device called an acoustic coupler. The first acoustic couplers/modems had a speed of 300 baud - 30 characters per second; later they were able to blaze along at 1200 baud. These were the first modems and operated at incredibly slow speeds compared to today’s 100 gigabits per second communications technologies.

In 1968, the Medical College changed its IBM RJE terminal to a CDC 1700, 16-bit minicomputer. This \$700,000 investment not only provided the RJE capabilities, but it also allowed the writing and processing of computer programs at home so to speak. The total amount of memory in that first computer was 8KB (8,000 bytes). I distinctly remember coming home one night all excited to tell my wife Pat that we had just received approval to double the amount of memory to 16K!! Today a smartphone with only 32 GB (32,000,000,000 bytes) is considered paltry.

As the head office of CDC (Control Data Corporation) was in Minneapolis, I made frequent trips there for training purposes flying on Northwest Airlines Boeing 727’s. CDC is yet another computer company of the 60’s which no longer exists.

The Advanced Research Projects Agency Network (ARPANET) started in 1969 and was one of the world's first operational packet switching networks, the first network to implement TCP/IP, and the progenitor of what was to become the global Internet. The network was initially funded by the U.S. Department of Defense for use by its project teams at universities and research laboratories in the US. American and later Canadian universities were the first to connect to

ARPANET; the University of Manitoba was added to the list of approved universities in the early '70's.

Roger Girard reminded me about BITNET in 2019. BITNET was a wide-area cooperative computer network made up of networks from different universities in the US. It was established in 1981 by City University of New York's (CUNY) Ira Fuchs and Yale University's Greydon Freeman. Its name was originally taken from the phrase "Because It's There Net," but later changed to "Because It's Time Net." BITNET became the foundation for today's Internet, especially to areas outside the US. The peak of BITNET was in 1990, when it connected roughly 500 organizations and 3000 nodes, all of which were educational institutions one of which was the University of Manitoba. It spanned the entire North American continent and had connections in other areas of the world as well. It was known as NetNorth in Canada, in Europe it was called EARN, TIFR in India, and GulfNet in some Persian Gulf territories. It still exists today.

My early years at the Medical College were taken up with programming projects with researchers in the Medical College and the Winnipeg General Hospital. The blood gas program that Dr. Brian Kirk, head of the Intensive Care Unit and that I wrote in FORTRAN ran on a teletype machine which was installed outside the ICU and was connected by phone lines to the CDC 1700. Dr. Kirk, along with Dr. Reuben Cherniack, established Canada's first intensive care unit which for well over a decade stood as a model for the rest of the country and the world.

I spent quite a bit of time with Dr. Cherniack who had a reputation of being very hard to get along with. I can remember coming home one day and telling my wife that I had had an argument with him and that I was not sure how things would go for me. Well the next day he came to my office to apologize and say that he was wrong. From that day on people would wonder why I got along so well with Dr. Cherniack when they were not so lucky.

One of my first peer-reviewed publications (little did I know that I would become an academic) was with Drs. Naimark and Cherniack; it was titled "Comprehensive Respiratory Information System for Clinical Investigation of Respiratory Disease" and was published in Methods of Information in Medicine, Vol. 103, No. 2, February 1971. Before I left the Medical College, in 1972, to go to the St. Boniface General Hospital, I wrote and/or co-authored several other papers, three of them being peer reviewed.

My later years at CDHS

In a few years, my job at CDHS became much more a management one as we had grown to a team of 12 people. I remember Bob Rollwagen, a young statistician that we had hired fresh out of the University of Manitoba. He came to me with an idea - about writing a program that was based on manipulating cells of data. Had we known at the time that, what he wanted to create would later show up as the wildly successful Lotus 1-2-3 spreadsheet application, we might have attempted an early IPO. Lotus 1-2-3 was one of the IBM PC's first "killer applications"; its huge popularity in the mid-1980s contributed significantly to the success of the IBM PC in the

corporate environment. During the early 1990s, Microsoft Windows grew in popularity and its Excel application gradually displaced Lotus.

Bob did not pursue the spreadsheet approach because he felt it would still be too hard to actually use for the type of statistical analyses needed by our researchers, clinicians, and doctors. Even today, the average person would have a difficult time using, say, Excel, to do a statistical analysis without some training. Bob shared the view that it was important to understand our users and what our mission was at CDHS: that is, to make computers easy to use, and making statistical analyses, or any analysis of data – as effortless as possible. With our new CDC 1700 minicomputer (that the user could access through a teletype in their own office), we could bring the power of the computer directly to them. Bob developed what was the first comprehensive statistical on-line computer system in Canada (if not the world). Every day, from somewhere in the medical & dental Colleges and hospital complexes, there would be someone typing in data on a teletype machine and getting answers back. Bob graciously told me that without my vision and encouragement this would not have happened.

Bob also came across the Statistical Package for the Social Sciences (SPSS) and said that it was the important counterpart we needed to have to a statistical on-line system (i.e., we only used punched cards as input up until then). SPSS had been developed by three students at the University of Stanford and first released in 1968. It was not, however, that user-friendly and consequently I began developing my lecturing skills by teaching how to use SPSS.

Bob said we had dozens of teletype machines connected to our computer -- in a time-shared, real-time environment. We were likely one of the early organizations in Canada to provide online computing to users.

We put on quite a few optional, non-credit courses and classes at the Medical College for both faculty, staff and students; the SPSS course was quite popular. Roger Girard thinks that I had to be one of the first to teach it - one of its first evangelists. SPSS became a mainstay in the industry - an important one in early analytics - and it is still around today. Teaching took up a fair bit of my time and looking back, I realize that it was clearly preparatory work for my forthcoming career. Our good friend, Dr. Jim Dutton, still tells people how I 'saved' him by teaching him how to use SPSS in his cardiovascular surgical research at the Royal Jubilee Hospital when we went to Victoria in 1979.

Over the last few years at the Medical College I was responsible for managing staff as well as the planning and preparation for the selection of computers systems. I formulated policy and procedures in system design, programming, documentation and operations for a staff of twenty who were involved in sixty computer assisted medical research and clinical service projects.

I can't recall associating myself with researchers at St. Boniface General Hospital (SBGH) but it must have happened because one day I was invited to the back garden behind the hospital for a cup of tea with the Assistant Administrator, Bob Beaudin. Bob invited me to cross the river and come to SBGH, the smaller of the University's teaching hospitals. I also recollect saying to him 'you can't afford me'. Apparently, I was surprised when he said, "try me" and he told me what it would take to lure you away from the Medical College and the Health Science Centre which

was next door. Bob told me that I was even more surprised when he said, "Welcome to St. Boniface General Hospital" and we shook hands to seal the agreement.

Dr. Saunders passed away suddenly in 1975, three years after I had left the Medical College. He had continued to be a valued mentor even after I had moved over to SBGH; he was only fifty-two years old. By that time, the CDHS had become the statistical centre for the Medical and Dental Colleges.

Dr. Richard Gordon -- whose primary Faculty of Medicine appointment was in Radiology with a cross-appointment in Department of Physics in the Faculty of Science -- was the Director from 1976-1981. He took over a staff of 15 people; the computer being used then was no longer a CDC but rather a DEC PDP. After he left, apparently there was no real leadership, and with the use of personal computers on the rise, funding was transferred to other Medical College departments. CDHS gradually ceased to exist; staff either left or were transferred to other parts of the University.

St. Boniface General Hospital, Winnipeg, MB (1972 – 1979)

I started at SBGH sometime in 1972 and reported to Bob Beaudin, the Vice President of Finance, though that title was not being used in those days. Hospitals in Canada did not switch to corporate executive titles (e.g. President and CEO) until the late seventies. Heads of hospitals were first called Superintendent, then Administrator, and then Executive Director before using the title President. The main reason for my going across the river was that I thought it would be good for me to get exposed to administrative, financial, and accounting computer applications in hospitals.

My first office at SBGH was just down the hall from office of the President Tony Quaglia. He was the only person that we knew in Winnipeg when we arrived in April 1967; he had worked with my Dad in Edmonton and though we only met while I was a teenager, he did remember me. It was in my office that I learned a great deal from a wise old gentleman, the late Mr. Elswood Bole, chairman of the Board. He was a gentle giant who would often pop into my office on his way to see Tony Q. On one occasion, he asked if there was anything wrong. I indicated that I was concerned that we were not making progress quickly enough – sound familiar? I had been at the hospital for only a couple of years. He quietly said, "How have things gone over the past year, any progress"? I responded yes and told him of some of our accomplishments. He then asked about the last six months, any progress? Yes, we had just gotten a new program up and running in the Emergency Department to which he replied, "Then what are you worried about!". He was the one who taught me, "Do your best and leave the rest", something that stayed with me and helped me tremendously throughout the rest of my life.

It was the same Mr. Bole who tactfully suggested in late 1975 that I shave my bushy and unruly black beard as he felt that it would not be an asset to future healthcare administrator. I had started the beard during our month-long vacation at a cabin we rented in July in the Lake of the Woods. The beard was gone shortly thereafter.

When I arrived at SBGH in 1972, I took over a small department headed by a Mr. Gerry Valentine, many years my senior. It was called Data Processing - a name we soon changed to Computing Services and later to Information Services. There was no computer in the hospital as all data processing was carried out at the Manitoba Health Organization (MHO) data centre which had started in 1970 and was being run by my longtime colleague Roger Girard. All the applications at the time were financial or administrative. I was committed to introducing the use of computer technology in the clinical operations of the hospital.

Roger Girard described the MHO history in the previously mentioned COACH publication that was edited by Steve Huesing. He believed that MHO was possibly the first true health informatics shared services in Canada and funding from the Kellogg Foundation got it started. It did initially focus on administrative/financial priorities, but they did dabble in statistical reporting and medical records abstracting as previously mentioned.

In the early seventies, only a few Canadian hospitals looked to data processing as more than a means of computerizing their payrolls, general ledger, and other routine, high volume recording tasks. In fact, in an internal hospital environment, even that was frowned upon as being high-risk with no ROI (return on investment). Those hospitals that did attempt to computerize were on a slippery slope. In all Canadian provinces in the early 70's, hospitals were not permitted to "computerize". However, as my friend Steven Huesing said, in those heady days of ignorance, many started to upgrade their 'accounting machines', and nobody knew the difference.

Lessons learned at SBGH

During my six years at SBGH, I was responsible for program development, design and management of all information systems, both clinical and financial. We developed several clinical applications for Pharmacy, Cardiology, Radiology and other departments. Most of these applications re-designed the forms that staff used from being open ended to being structured with specific boxes to collect specific data. One project that sticks in my mind was for the Operating Room; it taught me the critical importance of meticulous "definitions".

In our Operating Room project, we were collecting many pieces of data on every operation, one of which was 'time enter OR'. After six months or so, the head nurse came to me in the cafeteria and said "There is something funny with our data" - not what the head of Computing Services wanted to hear. After a lengthy discussion with her and a few of her staff, the problem was uncovered. Some of the nurses in the OR thought 'time enter OR' was when the patient's stretcher passed the reception desk right inside the OR doors on the way to outside the appointed theater. It was discovered that other nurses thought it meant the time the patient entered the 'theater' where the operation was to take place. It was routine for a patient to wait a few minutes before being brought into the theater; however, it was not uncommon for the patient to be held back, sometimes for up to an hour or more, while the theater was cleaned/sterilized from the previous case. This discrepancy meant that we had totally inaccurate and unreliable data on 'total time of surgery'. I was able to later make good use of this lesson in my University lectures on information theory.

There were many other learning lessons, such as when the medical head of the Emergency Department did not want to have any data collected. His fear was that the piece of data 'patient condition' which went from minor to life threatening would reveal that most patients were indeed minor and that it would affect staffing levels in the ER.

I was appointed to Medical Staff committees and to the Hospital's Planning Task Force. During those years, I obtained the Canadian College of Health Service Executives certificate in Hospital Administration. As a member of the Hospital's executive committee, I shared "on-call Administrator" responsibilities which meant being available on certain weekends and being prepared to make final decisions as need be. I cannot recall having to deal with anything serious, but I do remember working with very competent head nurses.

I was appointed the project leader to select a Medical Information System for the province of Manitoba in 1975. My friend and colleague Roger Girard, with his younger more accurate memory, filled me in on what happened back then. He reminded me that the late Sharron Gallagher/McMichael was working for me at the time; Roger reminded me that I had "stolen her" from his shop. Our selection team was split into two groups to travel to various sites to see systems that had been implemented. Sharron and Roger travelled to Wichita to visit a Burroughs site, to Portland Maine to see a TDS site and to York Central to see the IBM PCS. A number of us went to El Camino in California and to Duke in Charlotte.

Our team eventually selected the Technicon TDS4000 as the system to be installed in at the SBGH and the Health Sciences Centre. Roger recalled having a chat with his MHO boss, Herman Crewson, about the final decision and how the government was nervous about the eventual cost. Roger's response to Herman was that he felt that this was inevitable and that any decision to implement a single system across both hospitals was going to be cheaper than the current status quo where they were each undertaking their own different approaches - yes, they were competitive as multiple large hospitals in the same city usually are. Roger suggested to Herman that he should get a firm commitment from both hospitals to implement TDS; he said that he knew from discussions with me that this was a no-brainer at SGBH but he feared that the commitment at HSC was lukewarm. He was right; the HSC was not willing to make a firm commitment and the government never did provide the funding. The project died.

SBGH ended up implementing a Burroughs system, but this was after I had left. Roger and I both recall that John McKenna had replaced me, and that the Burroughs selection was, in a large part a political one, due to a quid-pro-quo with the provincial government for a new Burroughs disk drive manufacturing plant that was built in South Winnipeg next to where the Canadian Mint sits today.

It is noteworthy that the TDS system was eventually installed at SBGH in 2008 and at HSC in 2014. As of 2020, it is in all the hospitals in Manitoba except for Brandon. Might it be reasonably argued that we were ahead of our time in the mid-seventies?

I also chaired a provincial committee on government information gathering which went well beyond just collecting health data.

Creation of COACH

In the seventies there was a strong focus on hardware and the proprietary operating systems that supported application development. There was no 'networking' software in those days. Connections to peripheral devices were 'hardwired'. Some used to call them 'home runs' a cable that ran from the device (desktop or printer) to the computer in the computer room.

The nature of the market consequently led to vendor-based user groups where vendors could announce the virtues of their latest offerings and customers could present their achievements in the use of the technology.

One of the first vendors to focus on the hospital market sector was IBM. Under their patronage, ECHO (Electronic Computing Health Oriented) was formed in the US in 1969. ECHO held semi-annual meetings in resort facilities throughout the United States and at the time, typically attracted some 300 - 400 hospital people to these meetings. The agenda was a mix of IBM technology presentations and customer presentations; the meeting was run by an ECHO Board composed of member-elected hospital representatives. Membership was limited to IBM customers, though prospects could attend with their IBM Sales representative.

By 1973, IBM Canada had made a commitment to Canada and had created a National Healthcare Industry Co-Ordinator position, personified by Robert E. Zuckerman (Zuk to his friends), supplemented by a few staff positions. As part of his marketing strategy, Zuk encouraged the participation of his existing and potential clients in ECHO meetings. The fact that these meetings were held in the winter in resort locations in favorable climates was a considerable incentive to attend. At that time, few Canadians in the business knew each other - there was no natural means for networking or opportunities to learn what others were doing. That was about to change.

One of Zuk's clients, Steven Huesing, Assistant Executive Director of the Misericordia Hospital in Edmonton, was one of IBM's leading clients in Canada. Steve had been attending ECHO meetings for a few years; he found that he was able to apply the concepts behind some of the US work to the Canadian environment. ECHO meetings were a beneficial educational forum which met needs unfulfilled in Canada.

Sitting around a round table in the large ball room of the San Diego conference centre in March of 1975, a few Canadians agreed that it might be a good idea to see if one could create a "Canadian ECHO". Why I was even there is a mystery since we did not have an IBM computer at SBGH. Within 24 hours a lunch was arranged to which virtually the entire Canadian contingent of 9 people attended. The subject of creating a Canadian ECHO resulted in a unanimous "sounds good to me".

The inaugural meeting of the founders (and subsequently the first Board of Directors) of what became COACH (Canadian Organization for the Advancement of Computers in Healthcare) took place at the IBM offices in Regina in the summer of 1975, in attendance were:

- Marie Barrett, Director, Systems Management and coordination branch, Ontario Ministry of Health, Toronto, Ontario

- Rick Hopkins, Director of Finance, District 93 Hospital, Calgary, Alberta
- Steven Huesing, Assistant Executive Director, Misericordia Hospital, Edmonton, Alberta
- Robert Palmer, Director of Projects, Systems Centre, Department of Government Services, Regina, Saskatchewan
- Denis Protti, Director of Information Services, St. Boniface General Hospital, Winnipeg, Manitoba
- Robert E. Zuckerman, Health Care Industry Co-Ordinator, Data Processing Division, IBM Canada, Toronto, Ontario

Over several initial COACH meetings (one of which was held in the dining room of our home in Winnipeg) the constitution was drafted, and the name was chosen. I can remember a whole list of possible names being put up on a flip chart and that we had a lot of laughs with some of the acronyms. At one meeting Marie Barrett was wearing a red dress with white polka dots and someone suggested that we have red and white as our corporate colors. Most of all, an important decision was made that the group would be vendor-independent and not solely an IBM ECHO-like group. We knew that it was not what Steve wanted, but to his credit he accepted it.

We held our first conference in Ottawa in 1976; there were 120 participants and there were no vendors invited. Steve was chosen to be our first President and he served in that capacity from 1976-77. He subsequently became the Executive Director of COACH when we grew beyond being an 'all volunteer' organization. He also went on to become the first non-American President of ECHO.

I became COACH's 2nd President (1978-79) and it was on my watch that that we did our foundational works on the Security and Confidentiality Guidelines. Dr. Roger Côté was encouraged to become a member of our Board. I had been helping him with his groundbreaking work converting SNOP (Standardized Nomenclature of Pathology) which had been used in laboratories since the sixties to SNOMED (Systematized Nomenclature of Medicine) which Dr. Côté had started on in 1973. Though my contributions to his work were minimal, I sensed that what Dr. Côté was doing was going to make a critical contribution to our field. And of course, today, thanks to his exemplary efforts we have an international standard in SNOMED CT. Our biggest accomplishment was having Kathy Hannah become a member of the Board. Her presence opened the world of Nursing Informatics (though we had not started to use that term yet) to us and to the Canadian health care system. Over the years, the simulated, but realistic, 'skirmishes' that Roger (the doctor), Kathy (the nurse), and Steve (the administrator) had at our Board meetings were brilliant – they generated many moments of raucous laughter for all of us.

Just before I left SBGH in June 1979, I had started to work on an unofficial project with the Chief Pathologist, Dr. Marcel Hamonic, who was a senior official with Diving Canada. He felt that he could predict, when a child was quite young, whether they were going to make it to the big time (i.e., the Canadian diving team). He had seen countless parents spend large amounts of money, time and energy supporting their child in the hope of achieving an elite status. He wanted me to help him develop a computer program that would generate the kind of results that he could go over with parents which would predict the likelihood of their child ever reaching the highest level. We had had only a few meetings before I left for Victoria so sadly

nothing ever came of it. It would have been an interesting project to bring to fruition – the forerunner, so to speak, of today's use of “analytics” in many sports.

Helping to create and sustain COACH (now called Digital Health Canada) was an arduous but very satisfying part of my career. It took up a lot of my time. I was very fortunate to have a supportive senior management at SBGH as I was frequently travelling for meetings and conferences.

I truly enjoyed my working life at SBGH. The work was stimulating, and my colleagues were bright, friendly and cooperative; in those days it was fun to work in healthcare. I do remember the head of our Social Work Department telling me that I should take it as I was likely ‘too comfortable’ in my current job. He pointed out that my work had been going well for quite some time and said it was time for me to take on new challenges. Once again, little did I know what the future really held for me!

Royal Jubilee Hospital, Victoria, BC (1979 - 1981)

The run up to my time at RJH

The history of my job at the Royal Jubilee Hospital (RJH) began in March 1979 when I took a telephone call from a head-hunter. For the first few minutes, he talked about a job on the West Coast. I thought it was in Vancouver, so said, thanks but no thanks. Just a few weeks earlier, we discussed where we would ever move to (I had just turned down another job offer in Toronto). We had narrowed it down to London, Kingston, Saskatoon and Kelowna – all small cities. Victoria was not on the list because we thought that there was no work in Victoria. We had also decided that given the age of our three children, if we did not move within the next year, we were going to stay in Winnipeg until they all finished school. Anyway, the head-hunter said the job was in Victoria! Well now, that was a different kettle of fish. We finished our conversation by my agreeing to mail my resume to him before we left the next day to go to a conference in Versailles; if he was still interested, he could call me when we got back. Upon our return from France there were two phone messages waiting for me.

A week later I found myself being interviewed by several people in Victoria (one being Dr. Ken Thornton, the head of the Laboratory – a fine Yorkshire man who would later become a trusted mentor and very close friend). I finished my two-day visit in the office of Mike Fraser, the Assistant Administrator of the RJH (a wonderful man whom I wish I could have spent more time with) with me setting four conditions before I would take the job:

1. that I return for another visit with my wife,
2. that I be permitted to continue my national committee appointments which required having to travel to Ottawa or Toronto 3-4 times a year (at someone else's expense); the RJH's Administrator had, in all sincerity and seriousness, said “Why would you do that? Why would you ever leave Vancouver Island?”
3. that I would become a member of the hospital's senior executive committee and

4. that I would change the name of the department from Data Processing to Information Services.

I returned to Winnipeg to tell Pat that though it was very nice in Victoria, the job was at best a lateral move for me given how far behind the RJH was compared to SBGH. The fact that they were still using the old-fashioned title of Administrator when most of the larger hospitals in Canada had converted to naming their Chief Executive Officer a President, was but one indicator of the situation at the time. I also remember feeling that we were too young to think about retirement in warmer climes. The RJH at that time an 800+ bed non-teaching hospital yet it was being run like a small community hospital. One of the most influential members of the senior executive committee was the head of the dietary department. I did not expect that the RJH would meet my four conditions.

Well, lo and behold, about three days later, Mike Fraser was on the phone saying that they agreed to all four conditions and when would we like to come back to Victoria for another visit. After a chat with Tony Quaglia, the President of SBGH (and by then a very close family friend), and with his encouragement, we flew to Victoria. Just before we left, I received a call from the Vice-President of the Vancouver General Hospital. He had heard that I was coming to the coast and wondered if I would not mind dropping in for a visit on our way back to Winnipeg.

My second visit to the RJH failed to convince me that we should move to Victoria. However, something amazing happened about two hours before our flight was to depart for Vancouver. In my last meeting with Mike Fraser somehow the subject of teaching came up. Mike picked up the phone and called Dr. Rod Dobell, the head of the School of Public Administration at the University of Victoria. Rod, who later became a close acquaintance, had a reputation (undeniably undeserved in Rod's mind 😊) of always being either in Ottawa or on a flight to/from Ottawa. Well, this afternoon he was in his office and he answered the phone.

Half an hour later, I found myself in his office. We talked about his School and the topic of Management Information Systems (MIS) came up. It was a short conversation since we had to get to the airport, but it finished with him offering me a teaching job! He had to fly someone in from Vancouver once a week to teach an MIS course to their graduate students. He said I could take over the course and as it was an evening course, it should not affect my job at the hospital. Given that I did not have a PhD nor any formal teaching experience (I had done a lot of teaching in Winnipeg but none of it was for university credit), it took me by surprise - a very pleasant surprise. When I excitedly got back to the car, my first words to Pat were "I think we should move here; what do you think?". Her response was "Me too, I like it here". Keep in mind that the flowers were already out in Victoria and that we were returning to snow in Winnipeg. So, the actual reason we moved to Victoria was not the full-time job at the RJH, but the part-time job at the School of Public Administration at UVic!

As promised, we stopped off in Vancouver and I spent a couple of hours chatting to the VP at the VGH. I will never forget that he started the conversation by telling me that they had at least 40 different computer systems --- which they knew about. He offered me a job, but I was committed to the RJH and we did not want to live in Vancouver. I gave him some free advice and wished him well in finding someone. We flew back to Winnipeg and started planning our move to Victoria acknowledging that the timing was right since both our older children were

going to be changing schools and would have to make new friends anyway – why not in Victoria. Our youngest child was going into Grade One so the move would have less impact on her.

Two years at RJH

On July 1, 1979, I started my new job at the RJH as the Director of Information Services. As promised, I was appointed to the senior executive committee. Six months later, I was the most senior member of that committee – all the long-standing members, including Mike Fraser, had retired! An interim Administrator ran the hospital before a new head was hired. During my tenure at the hospital, I was responsible for developing and integrating the Hospital's information resources including data, text, voice and image. I developed a three-year plan for information systems program development (Dr. Thornton would remind me often over the years that it was the best plan he had seen). But when I left, Bill Thomson of Sierra Systems Consulting was contracted to replace me as --- ostensibly as an interim measure which ended up lasting eleven years. As a member of the hospital's executive committee, "On-call Administrator" responsibilities were carried out.

One of my most vivid, and painful, memories of my time at the RJH was that I regularly (sometimes twice a week) had to go to Vancouver having been appointed to a number of provincial committees. One was to chair a multi-hospital and government investigation of a Hospital Information System for Lions Gate Hospital in North Vancouver; another was to chair a Provincial Advisory Committee on Computers in the health system.

At that time, there were few flights to/from Victoria-Vancouver. We had to catch a 7:45 am flight from the airport to get over to downtown Vancouver for a 9:00 am start (there were no harbor to harbor or Helijet flights in those days). If we missed the 4:30 pm return flight from Vancouver we would have to wait till 7:15 pm for the next one – not likely the fiftyish daily flights today. Since most of our meetings were being held (for free) in the BC Hospital Association Offices downtown on Cambie Street, we frequently did miss that 4:30 flight. I was getting tired of the long hours away from home, so I met with the Deputy Minister of Health, Mr. Bob McDermit. He was a marvelous man who was sympathetic to my plight and he agreed that the committees I chaired could meet at a Vancouver airport hotel so that we would not miss the 4:30 pm flight home.

During my stay at the RJH, I was also asked by the government to be a consultant to the Royal Inland Hospital in Kamloops and was appointed to the Capital Regional District Health Resources Development Committee.

I do not have a lot of other memories of my short time at the RJH but two do stand out. I did soon realize that the most critical computer system of all was 'Payroll'. It had not been a worry at SBGH since the reliable Payroll system running at the Manitoba Health Organization never failed. Bill Thomson told me in 2019 that back then, RJH had its own payroll system on the hospital's Interdata computer. It failed often and at one point the nurses were lined up on the street with their dogs and kids waiting for manual pay checks to be produced; naturally, that was picked up by the local media. We subsequently moved Payroll back to the BC Health Association, which ran the Payroll for most hospitals in BC. RJH continued to run their

financial systems on the Interdata. I also have a nebulous memory of a Radio Shack computer system cobbled together from many handheld devices that was used on multiple nursing units to coordinate admissions, transfers and discharges.

My fondest memory at RJH was when we needed to replace the computer in Dr. Thornton's lab as it was failing more and more often; Bill Thomson reminded me that it was a Perkin-Elmer computer. However, the Ministry of Health had a 'freeze' on purchasing new computers. We came up with a scheme to obtain a new computer as a 'modification' to the existing one, which would not cost RJH more than we were already paying. Fortunately, the Assistant Executive Director, Chuck Rowe, bought the idea and we replaced the lab's computer. When the Ministry found out some months later, it was too late. Since we had not spent any additional money, we did not get into trouble – possibly because Dr. Thornton was politically very well connected.

Shared services in British Columbia in the late seventies

In 2019, Mike Nusbaum was kind enough to fill in some of my memory lapses. He was working in the Ministry of Health for Gary Cardiff, and later Bob Hawkins when I was at the RJH. In 1982, Bob had started the BC Hospitals Shared Systems Society (BCHSSS). It was funded by the Ministry to promote a cost-effective shared systems approach. It later became Health Care Systems, then later HealthVision which was later bought by Eclipsys. Eclipsys took the BCHSSS nursing system and converted it into Sunrise Clinical Manager which remains Allscripts flagship product to this day.

Given that the Ministry funded shared systems, RJH was a client of BCHSSS. The primary applications were finance, payroll, and ADT (Admissions, Discharges, Transfers which kept track of who was in what bed in a hospital). The BCHSSS applications ran on Digital Equipment's VAX computers, referred to as "minis" back then. A few years later, DEC introduced the "micro-VAX", which could be carted around as a portable device. In 2020, the last of those "VAX" systems were still running clinical information systems software in Edmonton at the Royal Alex hospital. In 2020, that old system was being converted to the Epic system -- along with, eventually, all of the other hospitals in Alberta. Whenever writing about the past, I always found it fascinating that in 1977, Ken Olsen, the President and founder of DEC said that "*There is no reason anyone would want a computer in their home*".

Mike joined Bob Hawkins at BCHSSS in 1983, the same year that I also employed him as an Adjunct Assistant Professor at the University, where he worked about half-time over a two year period developing and teaching courses in Health Administration (his University of Alberta degree) and the rapidly emerging field of local area networks. It was his first email experience via BITNET!

University of Victoria, BC (1979 - 2010)

Before I started at the School of Health Information Science

My life at the University began in September 1979 when I was appointed an Adjunct Associate Professor in the School of Public Administration and taught my first three-hour graduate class in Management Information Systems in the evening to 8-9 students. Kim McGowan told me in 2019 that he was in that first class; he worked in the University's computer centre at the time and was pursuing his Master of Public Administration degree. Sadly, I have no memory of that experience nor have I been able to find a copy of my first course outline. I taught that course 4-5 times over the next two years.

In the mid-eighties I was invited to sit, as a community representative, on the selection committee for a Director of a new program in Health Record Administration. In September 1979, as President of COACH, I had written a letter of support for the need for such a program. In November 1979, as Adjunct Associate Professor in the School of Public Administration, I wrote to Dean Payne suggesting the need for a Health Information Systems rather than a Health Records Administration program.

Health records administration education in British Columbia

The history of Health Records Administration education in British Columbia went back to 1963 when Notre Dame University in Nelson, BC, started a Medical Records Librarian Program. In 1973, that program lost its accreditation with the Canadian Association of Medical Record Librarians. In 1976 it was decided to phase out all Notre Dame University programs and as a result the medical records program ceased to exist as of June 1977.

The University of British Columbia was requested to consider moving the program there. A committee was set up within the UBC Faculty of Medicine under the chairmanship of Dr. John Milsum, head of the Community Health and Epidemiology Department. Charles Grierson and Lloyd Detwiller, Presidents of two Vancouver hospitals, were appointed to the committee as community representatives. Upon review of the proposed syllabus, the Faculty of Medicine rejected the committee's recommendation, arguing that the program was not of a sufficiently high academic level. Another undocumented reason for the rejection later surfaced in a letter written by Dr. Milsum and Mr. Detwiller. They disagreed with the Faculty's decision and wrote that "Medical Directors (and doctors) were not keen to have their work scrutinized".

As chair of the Universities Council (the government body that funded all BC universities), Dr. William Gibson knew that UBC had turned down the proposal and that Dr. Milsum had objected to the decision. He had the sagacity to call Dr. Howard Petch, the President of UVic, and persuade him to establish a new program. Dr. Gibson was a retired professor of History of Medicine and Science from UBC. He stressed to Dr. Petch that the program should focus on 'information' rather than 'records'.

Developing a Health Information Science program at UVic

In early 1979, Dr. Petch struck a Health Records Administration Committee which included:

- Dr. R. Payne (Dean, Faculty of Human and Social Development) as chair
- Dr. M. Ashwood-Smith (Biology)
- Dr. E. Chang (Computer Science)
- Dr. J. Cutt (Public Administration)
- Mr. D. Haliwell (University librarian)
- Prof. E. Kennedy (Mathematics)
- Dr. D. Kergin (Nursing)

In addition, members of the community appointed to the committee included:

- Mr. C. Grierson (Executive Director, GF Strong Rehabilitation Hospital and representing the Canadian College of Health Service Executives)
- Mrs. J. Bower (BCIT Health Record Technician Program)
- Miss L. Smith (Executive Assistant at the BC Health Association) along with two student representatives.

I was added to the committee sometime in 1980. Jim Cutt told me in 2019 that he recalled early committee meetings and a clear resolve that Health Records Administration (HRA) would not suffice for what was envisaged. There was much discussion, and the actual suggestion for 'Health Information Science' might have come from Charles Grierson. Jim said that his enthusiasm for the term echoed the chats that he had had with me while I was teaching in the School of Public Administration -- before I was appointed to the committee. He recalled my vision for a new professional, analytical, multi-disciplinary, and research-based degree that would be the first in Canada.

The 12 December 1980 minutes of the University Senate revealed that the Health Records Administration subcommittee, which had planned the now approved and funded Health Information Science program, was now serving as the search committee for a Director with a deadline date for applications of January 31, 1981. The committee also submitted a six-page proposal for the program.

After twice failing to find a suitable candidate, two University faculty members, Jim Cutt who sat on the committee and Dr. Alex McAuley of the Chemistry department invited me to lunch at the University Faculty Club in late 1980. Alex oversaw the CO-OP programs at UVic, and our program was one of the early adopters of this approach to education. I also knew Alex from the church we attended. At lunch, they encouraged me to step off the committee and put my name into the hat for the Director's position.

Jim's and Alex's suggestions were completely unexpected and flattering but was not without risk! First, the new head of the Royal Jubilee Hospital where I was employed had little respect for universities and all things academic. If he even got a whisper that I was thinking of applying I feared being fired on the spot. Secondly, I did not have a PhD which was the normal requirement to be appointed at a University. Since our field was so new and there were very few PhD's in the subject area in the world, Jim and Alex convinced me that my master's degree and my extensive experience in the field would be sufficient. Pat and I talked at length as to whether I should apply (we had three children and a mortgage), and we decided to go ahead with it.

This time around, two other qualified candidates also applied – both with PhD's. One was Dr. Walter Dietiker whom, as head of MIS at the Ministry of Health, had written a letter of support for the program in December 1980 and who I later hired as one of our first faculty members. The other was Dr. Ernie Chang – a former committee member and a physician who also had a degree in Computer Science and was already teaching at UVic.

The three factors which evidently swung the final decision in my favor were:

- 1) I had the broadest vision of where computers in health care were headed,
- 2) though not previously an academic, I had already published more papers than the other two candidates and,
- 3) the School of Public Administration submitted positive teaching evaluations from the three courses I had taught in Management Information Systems (ADMN 524).

Jim later told me that the committee members had only one concern about me and it was “Can this man teach?”. My teaching evaluations put that question to rest.

It was at this time that my wife and I came to fully realize that all the major changes in our lives had been totally unplanned. We also clearly recognized that had we not moved to Victoria two years earlier, I would have never been appointed as the inaugural Director since I would not have had any university teaching evaluations to submit to the selection committee.

The School of Health Information Science

The difficult first few years

I started on July 1, 1981, as the new Director of the Program in Health Information Science, founding the first academic program in Canada and one of the few in the world at the time. The new undergraduate program was added to the University's Faculty of Human and Social Development which at the time consisted of the Schools of Child Care, Nursing, Public Administration and Social Work. The program was then and remains today unique in Canada though there are now a few smaller programs in other universities in Canada. My first office was in the School of Public Administration for a few months. Our own offices were then created in the Cornett Building and later we moved into the new Human and Social Development Building.

An Advisory Committee were appointed by the Dean to support me in the first year. It consisted of Drs. Cutt, Ashwood-Smith and Kergin, Professor Kennedy as well as Dr. Graham Branton, the new head of the University CO-OP Education program

Before I was appointed to the selection committee it had been decided that the program would be a CO-OP based one; UVic already had the reputation that its Co-op education was second only to Waterloo University. Co-operative education is a structured method of combining classroom-based education with practical work experience. A co-operative education

experience, commonly known as a "co-op", provides academic credit for structured job experience.

This was a significant decision and is one of the reasons the program has been so successful all these years. It ensured that the program prepared students for jobs in the real world. It also provided the students with much needed funds as they were paid while on their work terms. Our students required to successfully complete four work terms along with all their academic courses to graduate. Further, many Information Technology departments, health agencies and companies that participated in the co-op program became supporters of the School. Many of them sent executives to deliver guest lectures, and ultimately hired the School graduates.

I was sensitive to the fact that I did not have a PhD; subtle and not so subtle reminder of that where always there. I began to pursue obtaining one and was seriously investigating obtaining one from the University of Utah; it offered one which would minimize how much time I had to spend in Salt Lake City. However, Jim Cutt, Rod Dobell and others discouraged me from pursuing a PhD saying that: a) it was far too time consuming, b) I was already on a tenured full professor track, and c) that there was too much work to be done getting a new innovative program up and running. It was exceptional advice!

I spent the first-year planning how the four-year CO-OP-based program would be offered. During this stage I discovered that the field of 'Information Science' was already well established and was the domain of the Librarians. I wrote letters (email was just starting to be used in those days) seeking advice from the international leaders of our emerging field and discipline – people such as John Anderson in England, Francois Grémy in France, Peter Reichertz and Jochen Moehr in Germany, as well as Don Lindberg, Scotty Pratt, Homer Warner, Octo Barnett and Morris Collen in the US. The most significant feedback I received was by far from Professor Dr. Jochen Moehr in Heidelberg, Germany (more about him later).

The major change I made to the six-page outline that I inherited from the HRA sub-committee was to make the program more about the use of computer technology in the wide-ranging health care field (from doctors' offices, pharmacies and hospitals though to provincial and federal departments of health) rather than the somewhat epidemiology-biostatistics program that had been proposed by the HRA subcommittee.

There were some challenging times convincing the University Senate to accept my different approach. My model had cut out some courses that other university departments wanted to be included as it meant new revenue for them. Others could not understand why I wanted to include a course from the Theatre Department – a course which would help our students cultivate their presentation and communications skills which I felt then, and still do to this day, as the single most important skill our students needed to develop. We did focus on having our students make frequent presentations in class; it became somewhat of an 'in joke' amongst the students. Over the years we often heard from our CO-OP employers that they appreciated how well the students were able to make presentations to both small and large audiences.

My original proposal, which was influenced by studying other professional programs such as law and nursing where 75% of the courses were taught by their own faculty. That model was seen by the Senate, controlled some said by Arts & Science, as being too restrictive. My revised proposal had only 50% of the courses to be taught. It was a difficult time since I did not have the support of my Dean. With the help of Jim Cutt and other politically experienced faculty and university staff, we were able to overcome a potential coup.

The initial curriculum was based, in part on the ACM's SIGBIO Group 1979 model curriculum for Ph.D. programs in the field of Health Computing. The Association for Computing Machinery (ACM) was a group of primarily American professionals working in the field of computer science and information systems. SIGBIO was one of the special interest groups and consists of individuals involved or interested in the application of computing technology in medicine and the biological sciences. The focus of their recommended curricula was to prepare graduates for careers in biomedical research laboratories, in computer-based education and in the development and use of health care delivery information systems. Our original curriculum was also heavily influenced by the ACM's model curriculum on Management Information Systems, a curriculum which specifically distinguished the field from that of Computer Science. Finally, Jochen Moehr and his Heidelberg/Heilbronn curriculum also heavily influenced the design of our UVic curriculum.

We taught our first set of 3 courses in 1982. In September 1983, the inaugural class of 17 students was admitted, as 2nd year students, into the School. Unfortunately, this coincided with the economic recession which affected British Columbia and all of Canada. By 1984, our program's five-year, \$1,920,075 (1980 dollars) ear-marked funding had been cancelled and our budget frozen at the 1983 level. The resources for 9.2 faculty members and an annual intake of 30 students per year were no longer assured; part of our program's funds was also re-directed to other parts of the University. The program's future was seriously in doubt, to the point that the University's Admissions Office was advising new applicants that the program was going to be terminated. It was a scary time! The program's team at the time consisted of only me, a part-time co-operative education coordinator and a secretary along with two sessional lecturers.

During the next two years, I and a dedicated group of sessional lecturers managed to teach all the required courses. It was a time when I and our new Dean, Dr. Brian Wharf (whose strong support I did have), met frequently with our students. The program survived primarily due to the pressure put on the University from the BC Ministry of Health, members of the health care community and a few others – more on that later.

In the early years of the program we interviewed every applicant, a process which was time consuming but one that we felt was important to our selection process. One interview is still in my mind. After a young woman left our office, my first comment was that she was an excellent candidate but a tad immature for her 26 years – but not enough so to reject her application. One of my colleagues said 'Protti, are you crazy, she is only 16 years old!' I had miscalculated her age, in part since most of our applicants in those early years were people in their mid-twenties or thirties – often changing careers and pursuing a 2nd undergraduate degree. The young, and now well-known, Dr. Jennifer Zelmer became one of our super star alumni. One of her accomplishments was being selected as the inaugural President and CEO of SNOMED International which determines global standards for health terms. While SNOMED CT is global in scope, it can be adapted to a country's requirements and each Member can develop its own terminology extension. SNOMED CT or SNOMED Clinical Terms is a systematically organized computer processable collection of medical terms providing codes, terms, synonyms and definitions used in clinical documentation and reporting. SNOMED CT is the most comprehensive, multilingual clinical healthcare terminology in the world. Jennifer is but one of the many luminaries we graduated and who are all over the world in senior positions; Jennifer herself is the President and CEO of the Canadian Foundation for Health Improvement!

Finally, on our way

In 1986, the freeze on staff hiring was finally lifted by the government and Dr. Walter Dietiker and Dr. Jochen Moehr were appointed to tenure track positions. As the familiar saying goes, the rest is history. In 1987, with the addition of Gerhard Brauer to yet another faculty position, the program was granted "School" status.

Over the years we twice reviewed whether we should change the name of the School to Medical Informatics, the name used by most of the programs in the US and Europe. Each time we decided to stay with Health Information Science in part because we had spent decades trying to inform the health care industry what we were doing and what kind of students we were graduating.

1986 was also the year our first scholarship, the Annie Greskiw Award, was founded. The May convocation that year saw the first group of twelve Health Information Science students receive their B.Sc. degrees. Sherry Miller had graduated the year earlier as she had come to us having switched in her last year of a Computer Science degree.

In May 1989, the School hosted a highly successful international conference on Medical Informatics and Education. It was attended by 360 people from 23 countries; there were 80 volunteers from the School and various organizations in Victoria, and Vancouver. The volunteers were one of the keys to its success. It was an unbelievably arduous undertaking which took us several years to recover from. We had made a bold decision to publish the conference proceedings in real-time and give them to the attendees. Unfortunately, we badly overestimated how many copies we would sell afterwards and that cost us dearly.

Also, around that time we started the "CHIT" conference (Community Health and Information Technology) in partnership with the Canadian and BC Public Health Associations. Our motivation was to create a low-cost forum for community health nurses who rarely had the discretionary funding to attend more expensive conferences. After the first year, Mike Nusbaum agreed to head it up, at which time he rebranded it to ITCH (Information Technology in Community Health) as a play on words on an outbreak of "itchiness". ITCH is held every two years and today it is an international conference with hundreds of attendees from around the world and a much broader audience than just community health.

In January 1990, the School was granted two more full-time faculty positions, bringing the allotment to six full-time faculty for the undergraduate program making it one of the largest fully dedicated programs in the world. Many of the programs in the US and around the world were formed with faculty members who have their primary appointments in other departments.

In 1991, the School's first two graduate students by special arrangement began their studies towards a Master of Science degree. We did not yet have a formal graduate program at that time.

In November 1992, the School celebrated its 10th anniversary and as part of the convocation, the School nominated Dr. Roger Côté, of the University of Sherbrooke, a renowned leader in the field of Medical Informatics, to receive an honorary Doctor of Science degree. In his acceptance address, Dr. Côté commended the University of Victoria for its leadership in having a groundbreaking program which was a model for others to emulate. At our anniversary celebration the Minister of Health, the President of the Greater Victoria Hospital Society and several other senior officials came to offer their greetings and messages of congratulations. At that time, we were six full-time faculty, four adjunct faculty, two professional staff, one lab instructor and two support staff. Over our first ten years, we had also attracted 18 visiting scholars from around the world who came to study with us for periods of up to a year.

1992 was also the year we moved into our current offices in the new Faculty of Human and Social development building. By that time, 113 students had graduated from the B.Sc. program; 75% of them were working in BC; 18% in other parts of Canada and 7% internationally.

I stepped down as the Director of the School in June 1993. Before my doing so, several of my fellow School Directors tried to get me to stand for Dean of the Faculty of Human and Social Development. It was intriguing possibility that some thought was given to but in the end rejected. I did not particularly enjoy the countless meetings that I had to attend as Director of the School; being a Dean would have meant even that many more. Prior to my stepping down as Director, my colleagues were encouraging me to stay on for another five years, but I had seen two other Medical Informatics programs in the US shut down when the inaugural Director died or left. It was time that one of our other faculty members to take over the School's leadership. Upon my return from a sabbatical year in July 1994, I was simply a humble professor. 1994 was also the year that Jim McDaniel, our first PhD student, graduated; he had studied under Dr. Moehr.

A survey conducted in 2002 of our 344 graduates revealed that 96% were employed and that 75% were working in the health care field.

A little bit about my teaching

Over the 1979-2010 time period, I taught twenty different undergraduate and graduate courses. Though it was a tremendous amount of work, teaching brought me enormous joy; I always felt grateful for the swift feedback. There are many in life who do not receive comments about their work and efforts for weeks or months. When one teaches, the feedback is often instant (you can sense when students are learning and appreciating) and when it is positive, it is invigorating.

In 2005, I was nominated for a UVic teaching award. Part of the dossier that had to be submitted included a statement on my teaching philosophy. I was strongly committed to the belief that we should develop the student's ability to work with others and to work effectively in groups. Students should be required to learn to collaborate with one another and work as a team in developing their views and exploring evidence to support these views. They should be provided the opportunity to realize that although problems will arise with certain groups, it is their role to resolve any conflicts and problems. This is very much akin to working in 'the real

world' in which any personal differences between group members must be addressed in order to ensure that important deadlines are met, and that the work is of the highest quality. As a result of my views, our School became known as one which included an abundance of 'group work'. I further attempted to facilitate this in several ways, one of which is to get to know each student by first name.

One of the rather unique characteristics of my teaching was the use of guest lecturers. I felt right from the beginning that it would benefit our students to learn from more than just myself. The 'message' might have more impact if it came from someone who was actually "doing it right now" - not unlike a teenager heeding a message from an uncle or aunt more so than from Mom or Dad. Hundreds of individuals from Canada, the US and abroad came to lecture. We were unable to pay them, but they all came at their own expense none the less; there was something about being invited to lecture at a University. Over the years, students would frequently return to the School from a CO-OP term and tell me 'do you remember what we discussed in class with so-and-so, well it happened just the way you both said it would'. Michael Beebe was one of the first of our alumni to come back as a guest lecturer. Michael was one of our early master's graduates and he would return for many years with his colleagues from the Veteran's Administration medical centre in Seattle.

One guest lecturer was Dale Sanders who I first met in 2001 at a small conference in Chicago. I had been invited to give a talk on Evidence Based Medicine (EBM) and Dale was there speaking on Enterprise Data Warehousing. He so impressed me that I immediately knew that I had to have him come to our classrooms; at the time he worked for Intermountain Health Care in Salt Lake City. He spoke passionately and convincingly about the potential that data warehouses held for the healthcare field. He caught everyone's attention when he spoke about Wal-Mart, one of the very first companies to use the power of a data warehouse. *In one story of analytic agility, a Wal-Mart manager on the East Coast prominently displayed an on-sale computer, the day after Thanksgiving, driving a spike in sales that far exceeded the sales of other stores in the region. Alerted to the sales anomaly by EDW analysts, Wal-Mart corporate managers quickly notified all store managers to display the computer in a similar fashion, highlighting the combination of a computer and printer for one low price. By the end of the day, sales in other stores had reached the levels of the original store. The integration of data from disparate sources enabled new understanding of business processes. The culture of Wal-Mart to quickly leverage this new understanding and adjust their business processes in real-time, underscored the power of combining analytic technology with a data-driven culture.*

I told him of a similar story from the Veteran's Health Administration in the US. One of the VHA guest lectures who came to teach told the class that the VHA had one of them, if not the largest, health data warehouse in the world. It contained dozens of years of rich clinical data. The VHA was committed to EBM so on a regular basis they would bring together some of their specialists, say urologists, and task them to study the data as to which clinical protocol was proving to be the most effective and safest. They would then inform all the urologists in all their hospitals, that effective a certain date, their computer system would be programmed to use only the preferred protocol. Individual surgeons were free to use their own protocol, but they would then have to defend their reasoning.

Dale did come to guest lecture in our 4th year and graduate classes for many years; by now he was a Vice President in Health Catalyst, a company he was part of creating as the result of his

work at Intermountain. We also developed a close friendship and working relationship and published several papers together on analytics and Business Intelligence. I had developed a simple model of the above VHA story as an example of a closed loop system for improving quality outcomes. Corrine Eggert agreed to work with me; she was skilled in graphics design and was interested in what the model was trying to demonstrate. It dawned on us that we should be inviting the health care system's more knowledgeable expert to join us. When Dale joined us, our model became much more realistic and sophisticated. Dale started to use it in some of his consulting, and it apparently resonated with his audience. He helped develop a paper which was eventually published in 201?

In the late nineties, my 4th year students analysed and compared strategic information technology plans that had been developed by regional health authorities. The project work entailed having the students compare the real strategic plans of the participating health care organizations (HCO) from across Canada. Students were randomly assigned to small groups of 3-4 students and linked with the CIOs and staff from the HCOs. At the end of the course, the students submitted a report, which compared and critiqued the various plans. Collaboration was mediated by various communication approaches, including visits of the HCO representatives to the university, site visits by students, e-mail exchanges, as well as tele- and video conferencing. Students acquired valuable professional knowledge and skills, reflecting the latest insights from the literature as well as the living professional environments. HCO professionals benefited from benchmarking their strategy against those of their peers across Canada. Both were able to use the mutual exposure for forging lasting employment relationships.

Another teaching method I used and encouraged my fellow faculty members to use was to mark assignments and exams blind. I did not want to know whose paper I was grading so students only recorded the last 4 digits of their student number on their papers. It also helped that assignments had to be typed, using the same font, rather than being handwritten. When all was done, I matched the last four digits to their names and inevitably I was surprised at both ends of the spectrum. Students whom I would not have predicted so did much better than expected and vice-versa, what I thought were stronger students sometimes did surprisingly less well than anticipated.

I also developed a technique to deal with students coming back asking for a higher grade. Since all my assignments were submitted online, I was able to put the 3-4 better assignments on the Web (after stripping out the 4-digit id's) for all the students to read. No one even came again to request a higher grade.

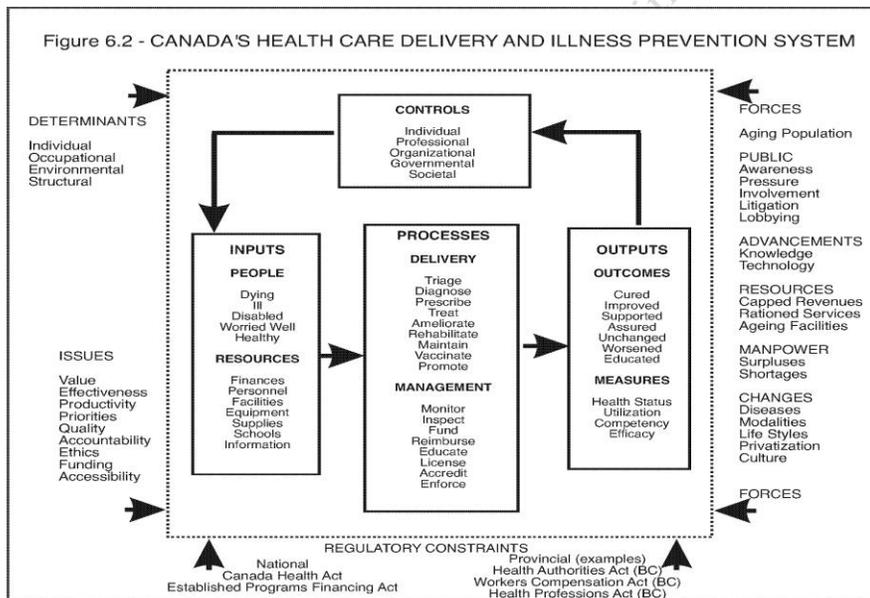
From the beginning, all my exams were 'open book'. After a few years, I introduced having final exams written in computer labs when it became obvious that students could type a lot faster than they could write. They were also free to use the Internet if they wanted to; surprisingly, few did as it took time to do so and I tended to set long exams with questions which often had no 'right' answer. I had a reputation for giving out very few A+'s.

I also had the very real satisfaction of co-teaching courses with colleagues from outside of Victoria. Two stand out, namely the 4th year course HINF 410 – Information and Management Technology co-taught with Dr. Michael Guerriere who was a general internist (with a extensive

computing technology knowledge) and the Executive Vice-President and Chief Operating Officer at The Toronto Hospital and who became a prized personal friend. We would set unique times for the classes and Michael would come out several each times each semester. I also co-taught the graduate course on Nursing Informatics with Dr. Kathy Hannah. This unique course was taught to both nursing and our students; it was the forerunner of the joint degree program that is now offered by the two schools. I always discovered something brand-new working with Michael and Kathy – as I did with most of the guest lecturers.

One of the courses I taught, and to which Karen Ondo would come up from Florida to take part, entailed the students being formed into teams. They pretended they were the CIO of a health care organization and were seeking project approval for their IT project. The rest of the class acted as the Board and voted on which project, they would approve – other than their own of course.

Finally, one of the courses I taught was Health Care Delivery Systems. For that course, I used a model of Canada’s health care system that I had developed while working at SBGH in Winnipeg. The Chairman of the Board asked me to describe the health care system on one page! I was quite proud of it and recall refining it over the years but sadly, when I stopped teaching that course, I put it aside and never returned to it or published it.



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It was based on General Systems Theory in terms of inputs, processes, outputs, and controls all operating with uncontrollable forces on them that defined a boundary. I recall being a stickler when it came to finding the boundary of a system. I argued that the boundary could be found by outlining the assumptions being made. As an example, in defining the boundary of, say, a new pharmacy information system, if it has not yet been explicitly stated or defined, we will assume that the system is expected to: a) function 24 hours per day, b) to handle all drugs including narcotics, c) deal with outpatients as well as inpatients, etc. etc. It was often when working through the assumptions that the system specifications or requirements were clearly defined and agreed to by all and the boundaries were found.

Key contributors to the School's development and its survival

Credit for the School of Health Information Science has first to go to Dr. John Milsum of UBC who raised the red flag which **Dr. William Gibson** saw a need to address. As chair of the Universities Council (the government body that funded all BC universities), Dr. Gibson had the foresight to call the President of UVic and convince him that UVic should create the new program. He stressed – and this is evidence of his vision - that the program should focus on information rather than records. If it were not for his initiative in 1979, it is possible that there would not be a Health Informatics program in BC.

A number of other people played particularly critical roles in the School's history and have to be mentioned. As mentioned earlier, in 1979, **Dr. Rod Dobell** was the Director of the School of Public Administration. If he had not offered me an opportunity to teach an evening graduate course in MIS, we would not likely have moved to Victoria to take on the job of Director of MIS at the Royal Jubilee Hospital. The School may have not even been created and, if so, it would likely have a very different look and feel than it has today. Dr. Dobell became a trusted and valued advisor who helped me with understanding the intricacies of running a department in a University. He and his wife Marnie also became fellow opera lovers with Pat and me.

As mentioned earlier, **Dr. Jim Cutt**, a faculty member of the School of Public Administration was a member of the selection committee for the Director of the new program in HIS. It was Jim, with Alex McAuley's help, who convinced me that I should step off the committee and put my name in to be a candidate for the Director's job. Until the day he retired, Jim continued to provide me with very valuable advice and counsel. Academic university life was very different from anything that I had experienced, and he helped me to understand it. Reconnecting with him in 2019 was a delight – I really enjoyed being exposed again to his quick wit and his astonishing command of the English language.

In 1982, **Dr. Jochen Moehr** was head of the Medical Informatics program at the University of Heidelberg in Germany – a program which he had created a few years earlier. I can still see the long-handwritten letter, that he wrote to me when I asked for his advice on our proposed curriculum; I only wish I still had that letter. Our many subsequent discussions both in person and by early use of e-mail significantly influenced my thinking about what it meant to develop an academic program in the newly emerging field of Health Informatics. Actually, the internationally accepted term at that time was Medical Informatics. It gave me a great deal of comfort and satisfaction when, four years later, he agreed to come and join us in Victoria. Pat fondly remembers our recruiting trip to Heidelberg – her job was to convince Jochen's wife to move to Victoria. Not surprisingly Jochen is now a precious and very dear friend.

I had come to know the late **Dr. Ken Thornton** during my two-year stint at the RJH. He was head of pathology and was one of the people who interviewed me in 1979. Ken had the power to say yea or nay to my appointment and eventually he became one of my most valued mentors and a close friend. In 1982 he joined me at the School and was the 2nd person to teach a course. He was an excellent teacher. His students enjoyed him so much that their friends would come to his lectures. One of his favorite sayings was that he was not a real doctor! As a pathologist he dealt with samples and slides, not patients. Ken also supervised Julie Comfort, the School's first master's graduate; he was a fine Yorkshireman with a wonderful accent.

Most importantly, Ken helped me shape the curriculum. As previously mentioned, I inherited what was an epidemiology and biostatistics program. Though I felt that there was need for including this content area, I did not think that having a whole program on the subject was what the health care field needed. In my opinion, there would be a lot of jobs for these types of graduates. We ended up creating a program which merged the three disciplines of computer science, organization theory and health care delivery – all in a CO-OP education framework. We had in mind the Chief Information Officers of the future – even if that term was not in the vocabulary at the time.

In 1983, the **late Murray Fraser** was Vice President Academic for UVic. Murray was one of the most sensitive and effective managers I have ever encountered. This was during the dark days of the School. Our guarantee for 5 years of earmarked funding was withdrawn from the Government due to the severe downturn in the economy. What little we had been given to date was thrown into the general university pot and we were expected to fight for funds alongside all of the established programs at UVic. Not an envious position to be in.

I can painfully recall the November meeting when he told me that the Program was going to be terminated. The Government was looking for “blood on the floor” from the University and we were ideal candidates. We only had 40 students, no tenured faculty and had just barely started. Murray Fraser made the lifesaving decision to let us continue for one more year – he accepted my argument that because of the sequencing of CO-OP terms, we could operate one more year without any additional funds. He could have terminated us. We have always felt very indebted to Murray Fraser for his decision.

In 1984, the **late Stan Dubas** was the Deputy Minister of Health. He was also one of our dedicated early sessional lecturers. He held his classes in the late afternoon in his offices downtown at 1515 Blanchard Street. Senior Ministry of Health staff would lightheartedly complain to me that they were envious - our students spent more time with the Deputy than they did. While I was out on the road trying to raise funds to keep us alive, Stan was instrumental in influencing the UVic Board of Governors that our program should be maintained - notwithstanding the downturn in the BC economy at the time. Without Stan’s intervention, we would not have survived.

In 1984, the **late Ian Stewart** was chairman of the UVic Board. He concurred with Stan Dubas and was subsequently able to convince the Board that it was important to save our program. Without his support, the School would not be here today. I later came to know Ian personally as a member of our church and enjoyed his accounts of the “smoke and mirrors” events of the time.

In 1981, **Kim McGowan** worked in the Vice President Academic’s office as a budget analyst. In 2019, I learned from him that we had met in September ’79 as he was in my first MIS class in the School of Public Administration; I had totally forgotten that. Kim also revealed that I came to see him after I had received an offer from UVic in early ’81. He strongly recommended that I only take the position if it was a tenure track Full Professorship; advice which Jim Cutt ardently reinforced. Little did I appreciate, at the time, how critical that advice was. In later years, I came to appreciate how difficult it is to be promoted to Full Professor.

Kim also told me that his boss, Vice President Fred Fischer, had discussed the Health Information Science proposal with him in the mid '80s. In that informal meeting Kim suggested that the program should be a professional versus an academic program – as were all the existing programs in the Faculty of Human and Social Development. He also suggested it needed a Director who was grounded in the practice of the field as opposed to an academic with limited or no practical experiences. He also pointed out that if it was to be a CO-OP program, it would be wise if someone from one of the Victoria hospitals was added to the search committee. He did not discuss it any further, but he did notice later that I had been added to the committee.

Kim knew his way around the University and was a very trusted colleague. He and Jim Cutt were instrumental in the first few years of program in helping me through the subtle, and at times dangerous, web of University politics. There were those on campus (including my own Dean) who wanted me removed and the program substantially changed from the direction it was headed. Without their help, I may not have personally survived and perhaps the School itself may have perished as well.

Partnership in Productivity

One of the outcomes of my search for monies when the School was under threat of closure was the creation of Partnership in Productivity (P&P). It came about as a result of a suggestion from the Medical Products Manager of Hewlett Packard in Toronto; he felt the need for a neutral forum to which he could send his junior and new staff to learn about the healthcare industry. He argued that he could not organize one as it would be perceived as a sales pitch; similarly, hospitals could not organize one because it would be perceived as a way of getting donations from vendors. A facilitator with no vested interest, working in an impartial forum such as a University was needed.

The very first P&P Colloquium was held on the UVic campus in February 1985, and quickly became a by-invitation-only and regularly sold out forum exclusively for:

- Senior executives of firms supplying goods and services to health care facilities
- Senior executives of health care facilities and authorities
- Elected and appointed senior Ministry of Health officials
- Senior executives from medical schools and professional associations

From its inception, it proved to be a very effective and neutral forum for the interchange of ideas in all areas affecting policy and the delivery and reform of health care in Canada. The number of attendees was intentionally restricted in order to foster candid and frank discussion; there were never any minutes, proceedings or recordings. The all-inclusive fee was set 'ridiculously high' according to the University conference department that I worked with in the first few years. I felt that if we were going to attract senior executives, we had to set a fee that reflected that we were serious. The fee included all expenses they would incur – the only other cost they faced was the costs to get themselves to Victoria. Fortunately, the media never got wind of the people who were attending; many of them were very high profile and did not relish media attention.

The Colloquium provided a unique opportunity for the participants to gain insight into each other's perspectives in a non-partisan environment. The opportunities to network, meet informally with peers and explore potential joint ventures were the primary reasons participants gave for attending the Colloquium. It was the only annual forum where executives from the non-profit and for-profit sectors could mingle and compare views on how to improve the health system. Every year, two thirds of the attendees had attended before, and one third were new to the Colloquium. This combination allowed close friendships to develop over time, while new people brought in new ideas to keep the conversations rich and provocative. We also invited guests from other countries to make sure we avoided a myopic, Canadian only perspective on the challenges of the day.

In 1990, my wife Pat took over all the local arrangements and helped make it an annual 'must attend' event - in part because of the outstanding spouse's program (later renamed the partner's program) that she organized. Many of the wives over the years 'told' their husbands that they must not miss attending P&P in Victoria. Not surprisingly, everyone loved Pat, and we were often told that we made a good team.

One year, after the dinner with attendees and their spouses, Ron Mulchy, then CEO of St. Paul's Hospital in Vancouver got up to regale the crowd with a joke. From that point on, the final evening featured an impromptu variety show of stand-up comedy, skits and songs put on by the leaders of Canadian healthcare. Through raucous laughter, close bonds were formed across the country that endured for many years to come.

In the early years, the monies remaining after all expenses had been paid were modest but sufficient to permit the School to fund student field trips to visit hospitals and provide occasional financial assistance to students. As the capital in the P&P account began to grow, the School could establish several bursaries and scholarships to annually award to undergraduate students entering the School. The James Coward Memorial Scholarship and The Barbara Thornton Memorial Bursary were established in 1989; the latter in honor of Dr. Ken Thornton, an early supporter and regular contributor to the first 10 years of P&P.

After organizing and running P&P for almost 20 years, Pat and I decided it was time to retire from this undertaking. Though it was very fulfilling, it was tiring and exhausting work. We mentioned this to a few of the regular attendees and began to seek out someone to take over. One of the keys to our success was that we provided a neutral forum that did not have any hidden agendas. There were a number of excellent candidates to take over the leadership of P&P, such as Michael Guerriere, but they either worked in the health care industry or for the vendor community, neither of which would be perceived as being non-aligned.

Fortunately, one individual fit the bill and that was Dick Alvarez, who at the time was the President and CEO of our highly respected Canadian Institute for Health Information. Fortunately, not only did Dick's organization provide another neutral forum, Dick himself was an ebullient, outgoing and an influential leader in Canada's health care system. When he took over in 2005, did he ever "kick it up a notch". What was already a healthy registration fee rose dramatically to new levels. Dick was not shy in telling attendees "you folks are getting a lot more value here than what you are paying for".

When Pat and I stepped down in 2004, a core group of the P&P participants made generous personal and corporate donations, in the amount of \$100,000, to establish the Denis & Pat Protti Endowment Fund at the University of Victoria. In 2008, Michael Guerriere's Courtyard Group committed to an annual \$50,000 donation to the Fund and did so for two years before the company was sold to Telus Health. In 2010, an anonymous donation of \$200,000 came in to establish the Denis & Pat Protti Bursary Fund. Both funds present annual awards to promising graduate students in the School's on-campus and distance-based programs. In addition, awards also support and enrich senior undergraduate students and graduate students by providing funding for short-term study at another university or health care organization.

By 2015, the Endowment and Bursary Funds had risen to over \$700,000. It is one of the largest named student award endowments at UVic. By that time, almost \$100,000 had been awarded to 31 students. In 2015, our son Chris started becoming involved to prepare himself to someday take as chair of the Denis and Pat Protti Endowment Fund committee. Our daughters Carmen and Danielle have also committed to becoming involved if need be.

In April 2018, a group of retired health care executives in Alberta brought my name up in conversation and were mentioning the success of P&P. One of them sent me the following note which he said reflected the views of many.

Back in 1985, when I was the Deputy Minister of Health, Denis invited me to his P&P Program. It was a great Program, very productive and real-life focused. I returned with my wife Anne for several additional years. We still have the wonderful Aboriginal drawings in a place of prominence in our dining room. The recent video was a great vignette, and an appropriate reflection on Denis and Pat's contribution to our civil society.

In 2018, a wonderful video was produced about a young man from Southern Sudan who had received one of our bursaries. We were filmed talking to him about his life as a boy soldier when he was 12 years old and his journey to Canada and the School.

By 2019, the Endowment and Bursary Funds had grown to just under \$1,000,000 dollars and was annually allocating almost \$50,000/year in awards and bursaries.

The School in 2020

Today the School offers five programs including the original Bachelor of Science degree in Health Information Science as well as a combined Bachelor of Science in Computer Science and Health Information Science. At the graduate level, there is an MSc program with on-campus and online streams and a PhD program (with formalization of a new flexible blended learning PhD program in 2013). A new double degree program was created in 2010 (the first-and-only degree program in Canada focused on nursing informatics); it is a joint Master of Nursing & Master of Science in Health Information Science.

All the degree programs are in high demand and the number of undergraduate and graduate students has risen steadily (doubling at the undergraduate level and more than doubling at the graduate level since 2005). Graduates of the programs continue to enjoy virtually 100% employment on graduation in positions across Canada and internationally.

In September 2019, the School had:

- 190 undergraduate students
- 64 Masters students (including 17 in the combined Nursing and Health Information Science program)
- 9 PhD students
- 8 Certificate Program in Health Terminology Standards students (a new program that started in September 2018)

By the end of 2019, over 1000 students (839 B.Sc.) will have graduated since the first class started in 1983.

As of July 2020, there will be a total of 9 full-time faculty, 5 staff and over 50 adjunct faculty.

Thanks to information provided by the current Director, Dr. Andre Kushniruk, the School is excelling in a number of other ways as well:

- students continue to gain employment in challenging and important positions (ranging from analyst, manager, on up to director and CIO) in government, the hospital sector, healthcare IT industry, and academia
- the School has remained unique in Canada in being the only School or Department devoted exclusively to health informatics and offering degrees specifically in health informatics at all levels (Bachelors, Masters and Doctorate)
- the School strengths in terms of research and consulting include: human factors in healthcare IT; safety of healthcare IT systems, usability engineering in healthcare; human, social and organizational aspects of health care information systems; methods for healthcare system analysis, design and evaluation; consumer health informatics; organizational, management and strategic aspects of healthcare IT; healthcare system adoption; nursing informatics; telehealth; health informatics education; and AI in healthcare
- faculty in the School have some the highest impact factors for their research in the entire university and their work is known internationally. They have expertise and have published widely in a range of areas in health informatics (including about advances in curriculum development and health informatics education)
- faculty in the School continue to obtain awards, fellowships and grants both nationally and internationally, including a new NSERC funded training program for data science in healthcare
- faculty and students in the School continue to collaborate nationally and internationally with leading researchers, universities, hospitals, companies and healthcare organizations across Canada, in the US, the UK, the EU, Japan, China, Australia, New Zealand, and South America.

- faculty have taken up leadership in roles (such as VPs in Digital Health Canada and IMIA) taking on work in areas including directing and overseeing international accreditation of health informatics educational programs worldwide

Remarkably, back in 1979, when the program was being considered by UVic, a BC Ministry of Health official looked at the proposal and wrote that there might be a need for maybe 4 graduates per year!

Work after retirement (2010 – 2017)

I retired from teaching at UVic in June 2010 but did not retire from research, writing, and consulting until 2017. Over the seven years after retiring, I worked about 15 – 20 hours a week though a few times I had projects which had me giving up golf and many other things; at times I was at it 50+ hours a week (Pat did not enjoy those times as it reminded her too much of the many years when that was my regular routine).

During this period, I enjoyed working with Alberta Health, the Vancouver Island Health Authority, MedCom in Denmark, the OECD in Paris, the Department de Salut Cataluyna in Barcelona, the European Commission in Brussels, Canada Health Infoway and the Canadian Institute for Health Information.

A significant piece of work was when I advised Accenture's Institute for Health & Public Service Value. They had been contracted by Lord Darzi in his capacity as chairman of the Sowerby Commission to conduct "Connected Health" - a \$1m international study on the employment of health information technology to drive integrated health care in eight countries. It entailed interviews, surveys of 3,700 clinicians and 10 case studies in Australia, Canada, England France, Germany, Singapore, Spain and the United States. This was probably the largest study of its kind at the time and gained significant recognition at HIMSS. The research identified key dynamics that characterized a successful journey to connected health, including clear vision, strong leadership, and strategic change management.

I spent quite a bit of time, both before and after retiring, with the Alberta Medical Association in Edmonton. Vic Taylor commissioned me to conduct several studies and prepare specific papers for them. The AMA's board of directors and CEO were particularly interested in the evidence and learnings from other jurisdictions. My work and our discussions were apparently of immense value in the AMA's strategy and strategic planning efforts. As with many such undertakings, I learned a great deal which I was then able to apply in the classroom.

In 2017, I began to unsubscribe from dozens of newsletters and scientific journals and stopped reading 1-2 hours a day to stay abreast of developments. I decided to 'fully retire' so that I could spend more time with my wife, and to undertake the genealogical research into my Italian and French roots.

Organizations worked with (1967 – 2017)

Over the span of my career, I was fortunate to have been a member of several national and international boards and committees and to have worked with over seven dozen organizations around the world. In addition to COACH, one of my more long-time appointments was being a member of Statistics Canada's Advisory Board for Health Programs from 1986-1996; from 1992 I chaired this group of advisers to Canada's Chief Statistician. Some of the other provincial, national and international bodies that I spent quite a bit of time working with included: Alberta Health and Wellness, Calgary Regional Health Authority, Canada Health Infoway, Canadian Institute for Health Information, Capital Health Authority in Edmonton, Health Canada, National Health Service in England, National Health Service in Wales (Chair, International Advisory Group from 2006-2009), University of Manchester's Health Services Management Unit, and the Vancouver Island Health Authority.

For a few years, I was invited to work with the Commonwealth Fund in Washington, DC, and wrote a number of papers for them. In January 2011, I had the unique experience of delivering a paper on "*International Lessons about Meaningful Use*" to a Bipartisan Congressional Health Policy Committee in Washington.

I also spent a fair amount of time in Denmark, working with MedCom, which was established in 1994 as a publicly funded, non-profit corporation; I was honored to be the keynote speaker at their 20th anniversary celebrations in 2014. MedCom facilitates the cooperation between authorities, organizations and private firms linked to the Danish healthcare sector. Their role is to contribute to the development, testing, dissemination and quality assurance of electronic communication and information in the healthcare sector. At the time, Denmark had, to my knowledge, the most interconnected health care system in the world as well as providing their citizens with on-line access to their own health data; data which was also shared with their health professionals. My many papers and presentations about their accomplishments apparently had some effect on their national health policy strategies.

From 2009–2013, I spent a significant amount of time working with colleagues in the Departament de Salut in Catalunya, Spain. I conducted research projects there and co-authored several papers comparing the application of health information technology in primary care in Denmark and Andalucía Spain. At that time, my research led me to believe that Denmark was the most advanced nation in the world while Andalucía was the most advanced region/province.

My time with Capital Health in Edmonton was particularly gratifying. As an advisor for them for almost ten years, it humbled me that they frequently took my advice and did what I suggested, one of which was to create an Expert Panel. They agreed, and for the last three years, I worked on this advisory group with three highly experienced and knowledgeable individuals: Dr. Michael Guerriere of Toronto from the Toronto Health Sciences Centre, John Glaser from Partners Healthcare in Boston and Karen Ondo, Executive Vice President, KLAS Enterprises, a market research and intelligence firm specializing in healthcare IT performance monitoring from Florida. We met twice a year to review and critique Capital Health's strategic information management and technology plans with the CEO Sheila Weatherall, the Senior Vice-President/CFO, Allaudin Merali, and the Chief Information Officer, Donna Strating.

An easier approach for them would have been to simply hire a consulting firm. They however sought the expertise of different people and brought them all into a room together at the same time for the feedback they anticipated needing. They were willing to face the 'brutal facts.' They were prospective at 'risk mitigation'. They sought out IT vendors/solutions that were rather unproven at their level of processing; they put the Orion company on the North America map. It was rare to find a CEO, CFO and CIO be on the same page and so willing and open in discussion. Karen Ondo pointed out that Allaudin Merali was the only CFO she had ever met that was more interested in 'getting the funds' needed as opposed to 'protecting/limiting his spend' first and foremost.

The discussions with the CH staff were at times difficult but the results over the years were paying off. That was another wonderful learning period for me since my three colleagues were all highly experienced in the implementation of clinical information systems. One of the recommendations that I recall CH adopting was John Glaser's "quarterly pearls" which meant the importance of being able to announce quarterly achievements, no matter how small they might be.

Perhaps we played a small part in the success that they enjoyed in the early 2000's building a reputation as one of the best health organizations in Canada. Their demise in 2008 -- when all nine Health Authorities in Alberta were disbanded and amalgamated into one new organization, Alberta Health Services -- was in a large part brought on because they were so successful.

I frequently gave papers at international conferences and consulted a few times for Dr. Salah Mandil at the World Health Organization (WHO) in Geneva as well as for the OECD in Paris and the European Commission in Brussels. In 1992, while a few of us were at the WHO in Geneva to write the first 'international' textbook on Health Informatics, Vic Peel invited me to spend a part of my sabbatical with him in his Department of Health Informatics at the University of Manchester. That led to our spending 3 weeks to 4 months over five years from 1994-1997 at the University of Manchester with Vic and his colleagues - it was a great and very rewarding period of time. It was there that I did some teaching, took part in a large UK-wide research project on electronic medical records and met some of the people who would later invite me to work with them on their national health information strategy.

Working with England's Department of Health

From 1998-2004, I advised the Department of Health and the National Health Service (NHS) out of their Quarry House offices in Leeds; again, going over yearly to England for periods of 3 weeks to 4 months. My teaching load at UVic had been arranged to be performed in two terms (8 months), leaving me free to concentrate on my research and publishing in the 3rd term each year. During that period, I met and worked with a number of superb English colleagues -- such as John Farenden, Peter Drury, and Mark Freeman - with whom I am still in touch.

In line with the rather random way my career has developed, my involvement in England had an interesting history that John Farenden brought to my attention in 2019.

John, Peter and Mark had been attending a meeting at the UK Treasury to discuss the business case for the information strategy they had been developing under the leadership of Frank Burns. Frank was CEO of the Wirral Hospital in north west England which at the time was one of the two leading pioneers of hospital systems in England. Frank was an inspirational figure, adored by the clinical staff at his hospital and a man of great integrity.

The Treasury mandarins (powerful British civil servants who move chess pieces behind the scenes) were clearly unconvinced and asked for independent reviewer opinions. Recognizing that, left to themselves, the Treasury officials might intervene and commission reviews from people potentially unsympathetic to the cause, John immediately proposed a set of names including mine. He had not met me beforehand, but he had heard Vic Peel talk about my work and felt that was recommendation enough. Such was the confidence with which the team pitched their proposed list of reviewers. The Treasury acquiesced and, unbeknownst to me, I had been appointed as a reviewer for the NHS information strategy, Information for Health – the only one from outside of the UK.

I and my fellow independent reviewers clearly convinced the Treasury that this was a good thing to support, and so Information for Health was launched in 1999 by the late Secretary of State for Health, Frank Dobson. It also sparked my ongoing relationship with the NHS for the next eight to nine years. An amusing little memory that I do have is when I attended a meeting at the Department of Health in London. It would have made an excellent episode for the hilarious 1980's BBC TV program, "Yes Minister".

I conducted a number of reviews for the Department, the most memorable being the report that I submitted in November 2001, *"Implementing Information for Health: Even More Challenging Than Expected"* which was suppressed by the Department (never to see the light of day as one of my colleagues put it) for over six months. Well, it was eventually made public on 13 June 2002 but only because the report was raised in the House of Commons on 24 May 2002, and as recorded in Hansard, in the House of Lords on 12 June 2002:

Dr. Evan Harris: (Shadow Minister for Science) To ask the Secretary of State for Health, pursuant to his answer to the Hon. Member for South Derbyshire (Mr. Todd) on 11 March 2002, Official Report, column 806W, if he will publish the report commissioned from Professor Protti by the Information Policy Unit and the NHS Information Authority on issues of implementing "Information for Health". [44054]

Mr. Hutton: (Secretary of State for Health) The report from Professor Protti is still under consideration. It is informing the preparation of the delivery plan for information and information technology that the Department is preparing as part of taking forward "Delivering the NHS Plan", published in April 2002. Professor Protti's report will be published later in the year.

My English colleagues said that this particular report was franker than my earlier ones and that it did not sit well with the governing political party of the day. I postulated that England's EHR journey was taking them through terrain more complex than expected. Their EHR landscape was more like the mountains of Afghanistan than the deserts of Arabia. One could not readily see the best route to follow – even from up high.

One of the more stinging comments that I made was that the NHS was focusing too much energy and effort on the so called "Emergency EHR". The Government's expectations were, in my opinion, too heavily based on achieving Prime Minister Tony Blair's famous 1998 quote in a speech, at a conference to celebrate the 50th anniversary of the founding of the NHS, when he said "If I live in Bradford and fall ill in Birmingham then I want the doctor treating me to have access to the information he needs to treat me."

I had been asked to answer the question "What policy statement can/should be made as to the development of the 24-hour emergency EHR?" This was a difficult question to reply to in part due to the wide range of views as to what was meant by the so-called 'Emergency EHR'. Much depended on how one defines 'emergency' which is actually a spectrum of unplanned, or unscheduled, needs which run from the worried well at one end to the nearly dead at the other.

Worried well → Non-urgent → Urgent → Emergent → Near Death (life threatening)

From a pragmatic perspective, the pressing business need for an EHR is on the left-hand side of the spectrum, not the right (Figure 1 below). There are tens of thousands of events/interventions, which occur daily on the left-hand to middle part of the spectrum; there are significantly fewer events/interventions that occur daily on the right-hand side. The small percentage of life-threatening cases (less than 10% of all ambulance calls according to "Life in the Fast Lane") require little historical data as clinicians tend to act on what data is immediately available (vital signs, blood type, etc.) – often referred to as 'treat as seen'. What has been shown to be very useful in life threatening cases is being informed of the patient's allergies and current medications – neither of which were readily available in those days.

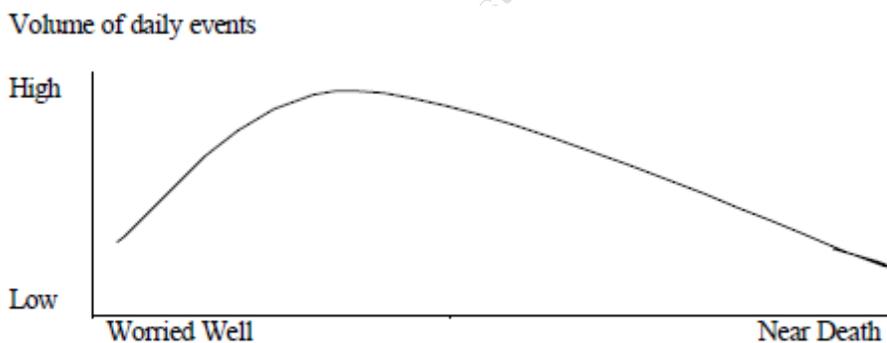


Figure 1: The 'Emergency' Spectrum

Those at the peak of the curve in Figure 1 are for the most part the elderly who generate the majority of unplanned care events – particularly the complex ones. It is in this arena that the greatest need exists to have details about the patient and to know where s/he has been in the past (i.e. the recording of events which some argued was one of the most important functions of the EHR) in order to assist in providing the patient to the most appropriate services.

I was told that another sensitive area I commented on was the NHS targets. In my 2000 review, I was of the opinion that the NHS was in 'initiative overload'. In 2001, it seemed safe to add that the NHS was also in 'target overload'. The number of targets and expectations on the

service was, in my opinion, too onerous. Targets were everywhere - the NHS Plan, NHS Cancer Plan, the National Service Frameworks, Out of Hours Review, and the Local Implementation Strategies to name but a few.

I could not help but sense that many parts of the NHS were feeling beleaguered, micro-managed, under-funded and suffering from a surfeit of “changeitis”. Many felt that the NHS was constantly in reaction mode to a barrage of requests from the Department, from Task Forces, and other national bodies. Few would argue with the soundness of the objectives of the performance management targets being generated -- it was more about the number of them and the field’s ability to monitor them all.

Perhaps my most contentious recommendation was that the Department of Health should acknowledge that, for a variety of real and very valid reasons, a number of the original Information for Health targets were no longer achievable in a meaningful way and should be revisited. Although my NHS colleagues took value from the advice it was clearly not what the politicians wanted to hear.

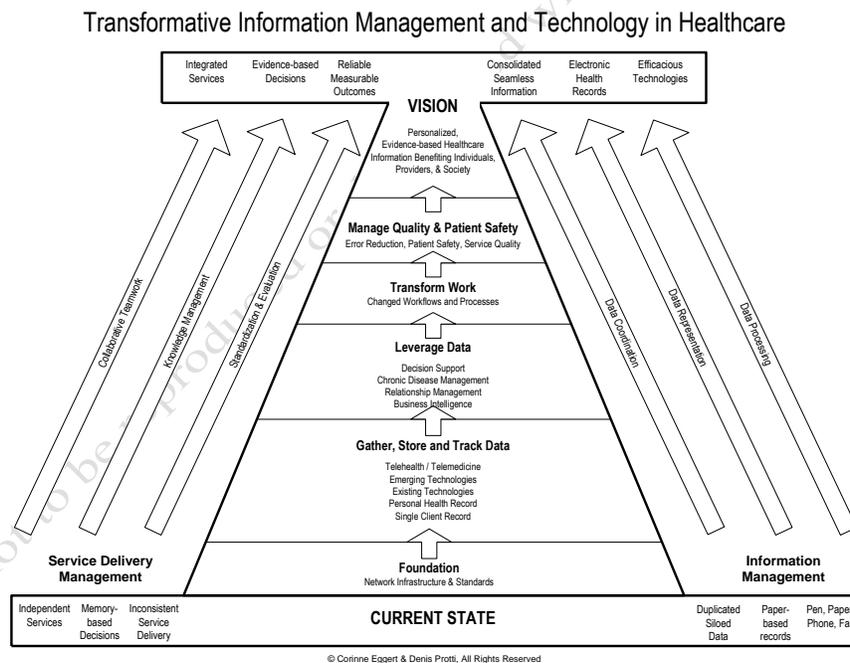
In 2002, the English NHS did indeed change direction and adopted a different approach through a highly centralized program the National Programme for IT (NPfIT). It was an ambitious programme with an initial bud NHS get of some £6.2 billion. It attempted to implement a top-down digitization of healthcare in England's National Health Service (NHS). The core aim of the NPfIT was to bring the NHS' use of information technology into the 21st century, through the introduction of an integrated electronic patient record systems, and reforming the way that the NHS uses information, and hence to improve services and the quality of patient care. The initiative was not trusted by doctors and appeared to have no impact on patient safety. The project was marred by resistance due to the inappropriateness of a centralized authority making top-down decisions on behalf of local organizations. The NPfIT was officially dismantled in September 2011. The underlying causes that lead to dismantling were the lack of adequate end user engagement, the absence of a phased change management approach, and underestimating the scale of the project.

It was fascinating to some of my colleagues in England that shortly after NPfIT was announced, I was invited to be the keynote speaker at a national health conference in Harrogate. That invitation was withdrawn because Richard Granger, the new Director of NPfIT, refused to speak if I was going to be the keynote. I understood the organizers’ wanting to hear from him, so I immediately agreed to step aside. They offered to pay all of my expenses, so I attended, nonetheless. Well, after his talk, I introduced myself to Richard. After chatting for a few minutes, to my surprise, I was invited to go to dinner with him and his senior staff members. Even more surprising was our relationship which went on for a number of years where Richard would seek my advice from time to time; I was perhaps the only person working in the field to spend time with him at his home in the Lake District. Unfortunately, I was not able to have the influence on him as I had had with others over the course of my career.

I thoroughly enjoyed my time working in England; I found it very challenging and gratifying. I was told on a number of occasions that I knew more about the Information for Health agenda than anyone else in the country. That might have been true, but I had the luxury of spending all of my time on the topic. Many other knowledgeable people, such as John Farenden, had other

matters to address in their working lives. John in particular was the person who most influenced my research and writing due his understanding of: a) the politics of the Department of Health, b) the history and running of the NHS, and c) the technical aspects of the national information strategy. The two of us spent countless hours analyzing, assessing and debating. They were some of the most stimulating and invigorating times of my whole career.

During the period of 2004 - 2008, I was commissioned to write a series of vignettes for the Department of Health. They were short articles on a variety of topics related to the use of computer technology in health care around the world with a particular focus on what was working versus not working. The documents were written for the Department staff as part of their continuing education program. In the latter years, one of our School's top graduates with outstanding research and writing skills, Corinne Eggert, a Health Informatics and Project Consultant, helped me considerably in writing the vignettes. Following publication of the vignettes with the UK NHS, Corinne devised a transformative model of information management and technology to convey: a) congruence of the vignettes with aspects of progressing information support in health care, and b) the key advancements required to move from current state challenges such as siloed data, paper records and memory-based decision-making to an envisioned future with integrated services, information and decisions where outcomes are measurable and reliable.



One of the high points of my efforts in England was developing the evaluation methodology that was used to monitor the local implementation of England's national Information for Health Strategy for the English National Health Service (NHS). For two years, the entire health system was using what were called "The Protti Scores". In 2019, John Farenden told me that he had recently met with a lady who, 20 years ago, was the CIO for Greenwich and Bexley Health Authority outside of London. She told him that she recalled the CEO at her health authority

telling her in no uncertain terms that he expected the locality to make rapid progress against the markers.

10.3 Critical Progress Markers

Each local health community is being asked to undertake a self-assessment using Professor Dennis Protti's Critical Progress Markers. The markers are attached as Appendix G.

From 2006 – 2009, I was based at City University London, in Dr. Abdul Roudsari's Health Informatics program; for up to 4 months at a time. I was teaching a graduate course, supervising students and conducting studies on behalf of the National Patient Safety Institute and other English health care organizations.

Working with BC Health Authorities

During the course of my career, I experienced the regionalization movement across Canada (except for Ontario) where hundreds of hospitals in a province were reorganized into Regions and later into even larger Health Authorities. In each case, the closure of small rural hospitals was part of the process. Alberta and Prince Edward Island went as far as creating one Health Authority in the province.

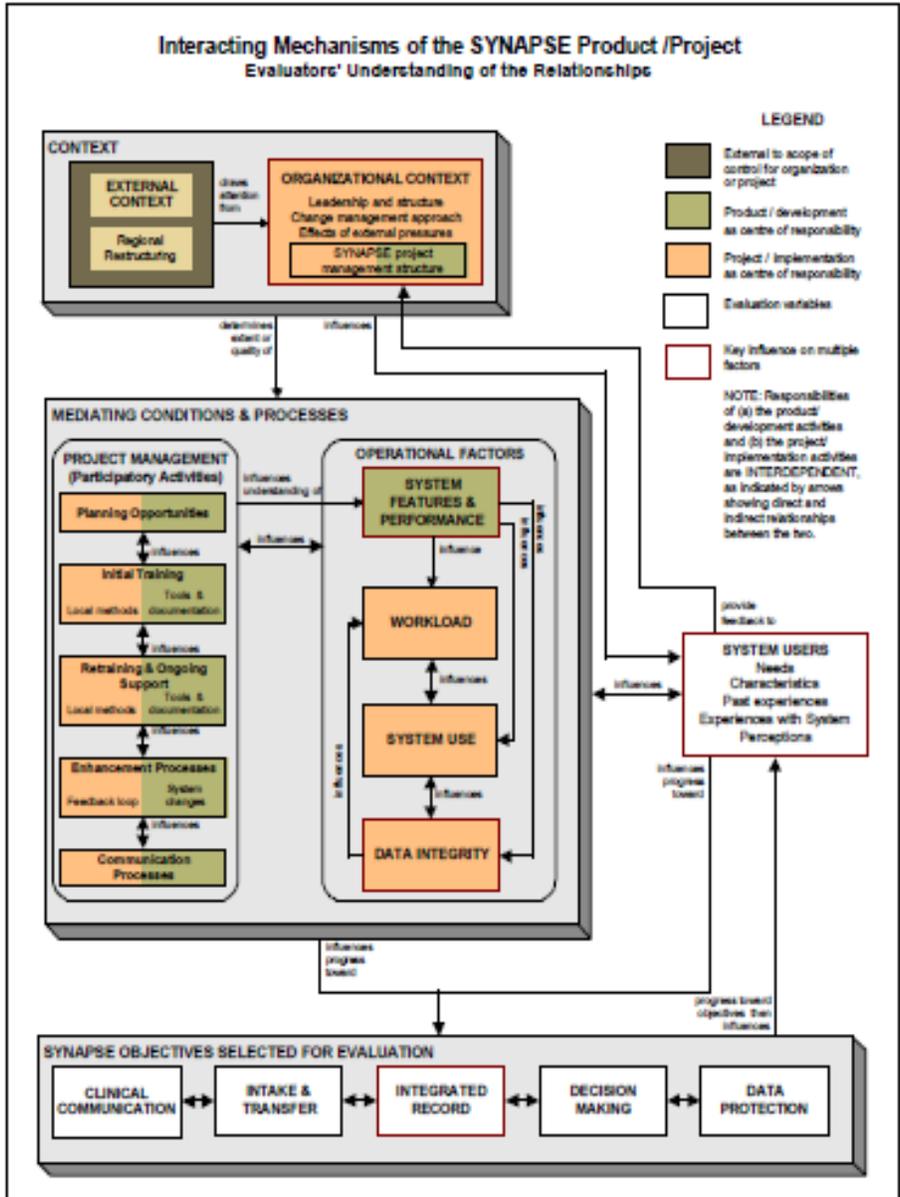
After arriving in BC, I had the occasion to spend time working with advising all six of BC's health authorities. Three projects were of some significance.

Evaluation of a Clinical Information System in Use

This one occurred while I was still teaching at UVic. In 2002-2003, Corinne Eggert and I teamed up with Vic Peel (formerly Senior Fellow and Head of Centre for Health Informatics, University of Manchester, UK) and Alan Thompson (then Executive Director, Standards and Performance Development at BC Ministry of Health Services) on an independent evaluation of SYNAPSE, a mental health information system, that had been installed in two BC hospitals and designed to address a "lack of integrated information systems for mental health in Canada" resulting in a 'lack of quality information about mental health patients/clients and the services they access'.

Funded by the Canada Health Infrastructure Partnerships Program (CHIPPP), the evaluation set out to assess the impact of SYNAPSE on clinical activities in order to make recommendations for strengthening benefits and resolving identified limitations. The evaluation's mandate was to ascertain the success and challenges of SYNAPSE from the point of view of system users, support staff, and the SYNAPSE leadership team at a particular point in time, using a multi-method approach using participant-selected, clinically related key objectives. As a result of the many interviews, observations, survey findings and synthesis, we devised a model representing the multiple interacting mechanisms that influence the use and success of an information system. If the truth be known, Corinne created the model and the rest of us simply suggested a few minor changes.

Exhibit 2-5. Interacting Mechanisms of the SYNAPSE Product/Project



Our review of an information system in use, was a classic case that success is correlated with devoting resources and time to usability considerations, appropriate training, data integrity, clear sponsorship and clinical participation during development, as well as ensuring capacity for concurrent change (e.g., when broad reorganization is underway). Committing to ongoing support of the system's users is vital; for example, the system was functioning much more effectively in one of the hospitals.

Deciding whether or not invest more funds into an EHR

In 2011, the Vancouver Island Health Authority (VIHA) intended to significantly expand their electronic health record (EHR) capability well beyond the traditional boundaries of acute care. Before committing the funds, which would be required, the VIHA Board directed its CEO,

Howard Waldner, to commission an independent, 3rd party assessment of the intended direction of travel and produce a written report to the Board by the end of January 2012. I was commissioned to undertake a review of VIHA's strategy with regard to the expansion of their EHR using existing and future Cerner Corporation products.

VIHA had stated its intention to move to a more Integrated Care (Cross Continuum Coordinated Care) model of delivery that seeks to improve the quality of care for individual patients and carers (clinicians, family, and others) by ensuring that services were well coordinated around their needs. It was what is referred to as a 'patient-centric' approach in contrast to the current health systems around the world which have been designed to be provider and/or organizationally centric. This requires high-quality collaborative working relationships, clarity and commonality of objectives, frequent communication among team members, a clear understanding and respect of individual roles and skills within the team, and the general flexibility of practitioners. Fortunately, a few organizations such as the Veteran's Health Administration and Kaiser Permanente in the United States and Andalucía in Spain have led the way in showing the benefits of an integrated care approach.

VIHA also wished to move towards a Population Health Management (PHM) approach which would facilitate the forecasting and identification of patients in need of care management – the so called 'upstream' population who have yet to 'fall into the river'. As a result, over the next 3-4 years VIHA expected to become almost paperless by:

- Extending its 'One Patient - One Record' concept to include all the aspects of care provided in Home and Community Services and Residential Facilities.
- Doing all of the above on one single Cerner-based system rather than with a multitude of so called 'best of breed' systems which would have to be interfaced.

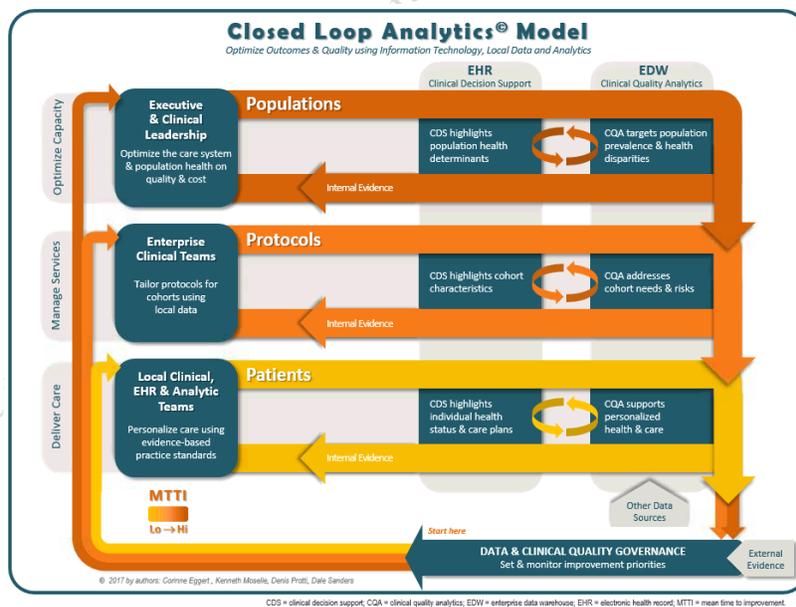
My report pointed out that given the very significant number of workflow and cultural changes which would be required. VIHA had had a close working relationship with the Cerner Corporation for a number of years. In my opinion, VIHA was on a laudable path which made eminent sense. However, like any journey in life, it came with its own challenges, hurdles and risks. This was not an IT project; it was an organizational change management undertaking. There were going to be significant changes to clinical workflows and patterns of practice, particularly for physicians. This was not an inexpensive journey; there were no quick and dirty solutions to what was to be undertaken. The all-important matter of timing and sequencing would be influenced by politics, readiness and a host of other factors. Research suggested that those who have been successful in this arena had tended to be very pragmatic about their priority setting. If a true One Patient - One Record was to eventually be realized, the primary care data would have to be included eventually.

I recommended that, notwithstanding the many risks they might face, VIHA enter into a special alliance with Cerner. There were always additional hazards to changing suppliers. The time, cost, and effort required to change vendors would be far-reaching. Cerner already knew VIHA's objectives, how VIHA operates, and VIHA's uniqueness as well as its quirks. Having worked closely together for many years VIHA and Cerner had established a close working relationship of value to both parties. A good vendor relationship results from a considerable investment in time and energy from both sides; clearly VIHA has already made a significant investment in Cerner and it would not be prudent to throw it away by switching vendors.

Environmental Scan and Gap Assessment of Analytics Capacity

In 2013-2014, I was commissioned by the Vancouver Island Health Authority to conduct an environmental scan of international healthcare organizations that had achieved proven clinical and financial benefits as a result of their use of health information technology, e.g., cross-continuum electronic EHR, patient portal, advanced data warehousing and/or clinical analytics. Noticeable among many of them was evidence of their management team's readiness to 'close the loop' – the practice of acting upon the evidence generated by variation analysis to establish standard order sets, protocols and processes and embodying these in the electronic health record/clinical information system that supports their day to day care processes – as being done at the Veterans Health Administration and Kaiser Permanente. Subsequently, I provided a gap analysis of Island Health's clinical and business analytics capabilities compared to the best practices identified in the previous environmental scan. Referencing the noted findings, learnings from interviews with Island Health staff and consideration of the new Healthcare Analytics Adoption Model© (HAAM) as a framework, this report compared and contrasted Island Health's current capabilities to those of leading organizations. It also provided guidelines for developing advanced analytic capability and associated governance by progressing through the model's eight levels.

As a result of this work, a collaboration with Corinne Eggert (Decision Support, Island Health), Dale Sanders (President of Technology, Health Catalyst) and later, Dr. Kenneth Moselle (Director of Applied Clinical Research Unit, Island Health) led to further development of the closed loop concept and publication of the Closed Loop Analytics model.



The two key concepts represented by the model are as follows:

Closed Loop Analytics© refers to the practice of integrating analytic data into decision support activities occurring at three levels of a healthcare system as shown in the model, from personalized patient care to population health management. This is achieved by taking granular data that are collected in an EHR during the course of delivering care, then linking that data with multiple other data sources in a data warehouse. Then the data are analyzed using statistical tools appropriate to

the task of process or causal modelling and outcomes evaluation, and the resulting information products are presented back to decision-makers (patients, clinicians, operational management teams and strategic planners). Together with clinician-validated protocols and order sets, these structures, tools and processes deliver the products of Closed Loop Analytics© to the points of decision-making to improve both standardization and personalization of care.

Mean time to improvement (MTTI) is the average elapsed time from recognizing that something can be improved to actually implementing an improvement. Leading healthcare organizations strive to lower their MTTI, by 'closing the loop' as described above.

Professional organizations, research and publications

Having been around for a long time, I was a founding member and fellow of a number of professional organizations including:

American Medical Informatics Association
1972 - Founding Member

American College of Medical Informatics
1989 - Fellow

British Computer Society
1994 - Member
2003 - Life Member

Canadian College of Health Services Executives (CCHSE)
1976 - Member

Canadian Organization for Advancement of Computers in Health (COACH)
1975 - Founding Member
1978 - President
1982 - Life Member

International Academy of Health Sciences Informatics
2017 - Founding Fellow

International Medical Informatics Association
W.G. 1 - Education
1982-99 - Canadian representative
1989-95 - Chair
W.G. 4 - Data Protection in Health Information Systems
1979-89 - Canadian representative
MEDINFO '94 Editorial Committee
1993-95 - Member

My research interests varied over the years. Upon starting at the University of Victoria, I was very interested in curriculum design for our new field. I spent a fair amount of time identifying

other similar academic programs around the world and comparing them to ours. That work included trying to find a way to accurately categorize programs. I never succeeded in doing so, due to significant challenges with the terminology used in different parts of the world and the way academic programs were structured.

I spent quite a bit of time on security and confidentiality -- even before I went to UVic.

Chief Information Officers became a focus of my research along with the matter of Chief Medical Information Officers. That moved me into the arena of Hospital and Clinical Information Systems. Later I found myself in the domain of computing in General Practice, and during that period I was commissioned by Canada Health Infoway to study the subject in 10 countries. That study was motivated by a Commonwealth Fund study in 2006 which reported that Canada and the United States were both significantly behind the rest of the world when it came to the use of technology in primary care. From there, I transitioned into national health information strategies and plans. I finished my career studying and commenting on how information technology was being applied in many of the western health care systems around the world.

I published hundreds of papers in peer-reviewed academic journals, in professional journals and in so called trade publications. As an academic it was critical to publish in peer reviewed journals. However, I always felt that in some ways it was more important to publish in professional journals – the kind that people ‘in the field’ read more than they do academic journals. After I had received my tenure at the University, I increased my contributions to professional publications in the hope of helping move the information agenda forward in Canada. I also published dozens of papers/reports, all of them substantially longer than a traditional academic paper. These show up in my Curriculum Vitae as “Unpublished Reports to Research Sponsor”.

I was privileged to have been granted a number of awards including the COACH leadership award in 2008 along with a life-time membership. Also, in 2008, I was the first recipient of the Canadian Health Leadership Network’s MacNaught-Taillon Award for my contributions to Canadian health care. In 2012, I was the inaugural recipient of the Techna Health Innovator Award.

In 2009, I was awarded an honorary Doctor of Science degree from the City University of London for my contributions to the British health care system.

Closing thoughts

So ends the account of my professional life as best as I can remember it – with the help of many friends and colleagues. I have been fortunate and very privileged to have had a full and satisfying career, one which granted me the opportunity to work on challenging and exciting projects around the world and in particular in Europe. It was a blessing to have collaborated, worked and laughed with many fine individuals – far too many to name. If I had to do it over

again, I am not sure I would change very much – in part because of the realization that all the major changes in my life were unplanned.

Towards the end of my career I was frequently asked, what are the keys to success, why are some jurisdictions (be they organizations or even countries) able to prosper with their application of information technology while others are unable to make much, if any, progress? When reflecting on what I had observed and learned over 40+ years, I concluded that there were indeed, in my humble opinion, a number of what might be called critical success factors.

In the style of David Letterman, I developed my top 10 list starting at the bottom and working towards #1. Without taking up any more space in this discourse and acknowledging that it would be easy to develop arguments to order them differently, the bottom nine in my opinion were:

- 10 Acknowledgement of Patient Involvement
- 9 Commitment to Privacy and Confidentiality
- 8 Comparative Culture and Feedback
- 7 Performance Measurement and Transparency
- 6 Commitment to Standards and Certification
- 5 Competent Health Informatics Professionals
- 4 Reliable, Rapid, and Flexible Infrastructure
- 3 Robust Project & Change Management
- 2 Active Clinician Involvement

Clearly not all of these factors applied to all of the multitude of applications in health care. For example, patient involvement and a comparative culture applied more readily to regional or national undertakings than say the application of technology in one department of an organization. In any event, I felt more strongly about the bottom two in the above list, having seen, in particular, significant failures due to the lack of active clinician involvement and an underestimation of the critical importance of managing change, especially in clinically related projects.

There was however one critical success factor that consistently rose to the top of all the positive developments I studied. In my experience the singular most important factor in the successful application of information technology in health care settings is LEADERSHIP!

Whenever I worked with or reviewed a productive jurisdiction, be it a country, a regional government, a large health care organization or a single department, there was always one person, usually supported by a few others who provided the leadership which led to success. In health care, particularly in regional, provincial or national jurisdictions I was often able to identify political, organizational, clinical, and technical leaders. These individuals, and particularly the organizational leader, displayed a number of characteristics and abilities which in the interests of time and space are simply listed as:

- Displaying Vision and Shared Values
- Setting an Environment for Change
- Establishing Solid Governance Structures

- Executing Pragmatic Priority Setting
- Committing to Training and Support
- Communicating, Communicating, Communicating
- Establishing Resources and Incentives
- Committing to Process Improvement and Quality
- Adapting Legislation, Policy and Regulations
- Exercising Courage and Patience (ROI takes time)

I would share the views that, in my opinion, outcome is correlated with change which entails policies, processes and practices. Worth is correlated with time; in health care payback takes at least 4 years. Value is correlated with connectivity because value is synergistic, and success is correlated with size. It seemed to come as a surprise to my audiences that by 2017 I had never found a national (e.g. Denmark) or a regional (e.g. Andalucía in Spain) or even an organizational (Kaiser Permanente in the US) success story that dealt with more than 10 million patients or citizens.

Sadly, I rarely felt that I had an uplifting response to one particular question from audiences or groups that I met with. It was a question which came much too often, "What do we do if we do not have these kinds of individuals, these kind of leaders in our organization?".

I would encourage them to be proactive and act as a leader themselves. One suggestion I would make is to encourage the person in your organization who should be leading to go and visit a more successful organization – making sure that s/he meets with her/his peer. Sometimes the comments from the leader of the more successful organization will rub off and will influence your potential leader. I would point to the studies and academic papers with suggestions on what it takes to be successful and encourage them to somehow get this information into their potential leader's hands. Trying to answer that question rarely left me with a good feeling.

In any event, I would leave my audience with one of my favorite quotes which supports my predisposition to the vital importance of leadership.

"Champions may initiate improvement, but it depends on top level organizational leaders to create an institutional culture ready to accept change, and to spearhead the spread of particular improvements".

Thomas Bodenheimer
The Science of Spread: How Innovations in Care Become the Norm
California Healthcare Foundation
September 2007

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I am deeply indebted to a number of people who reviewed my ramblings, corrected my mistakes, and reminded me of historical events that I had completely forgotten about. In alphabetical order they are: Dick Alvarez, Bob Beaudin, Jim Cutt, Rod Dobell, Peter Drury, John

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I owe a debt of gratitude to Michael Guerriere and my fellow Victoria Choral Society tenor, Charles Moody, both of whom graciously edited my work. With their enlightened command of the proper use of the English language they graciously polished my unsophisticated work. Any remaining errors are mine alone.

Finally, I am also grateful to Dr. Andre Kushniruk and the School of Health Information Science for offering to publish and promote this document to those who may be interested in the history of computing in health care and medicine in Canada, and abroad, and my humble involvement in it.

Appendix - the history of the field of Health/Medical Informatics

In 1834, Charles Babbage, a Cambridge mathematician conceived of a machine which was strikingly like the modern digital computer. The punched card system of 'data processing' was invented in 1889. In 1936, British mathematician, Alan Turing invented what became known as The Turing machine; he called it an "a-machine" (automatic machine). In 1939, Turing took up a full-time role at Bletchley Park in Buckinghamshire – where top-secret work was carried out to decipher the military codes used by Germany and its allies. There, he succeeded in cracking the famous 'Enigma' code.

In his excellent 1995, 489-page text, *"A History of Medical Informatics in The United States: 1950–1990"*, Dr. Morris Collen wrote that the world's first fully functional, program-controlled, general-purpose, electromechanical digital computer was achieved in 1941 by Konrad Zuse in Germany. In 1943, Thomas Flowers of England built the earliest programmable electronic computer which contained 2,400 vacuum tubes. Called the Colossus Mark I decrypting computer, it translated 5,000 characters per second and used punched tape for its input.

It was not till 1959 that the term "punched cards" was added to National Library of Medicine's Cumulated Index Medicus. In 1960, there were 15 citations under 'automated data processing'. According to the 1963 study, *"Cooperative Electronic Data Processing for Minnesota Hospitals"*, seven percent of America's ~7,000 hospitals were using 'automated data processing' equipment but mainly in accounting and finance. In 1965, there were only 40 citations under 'automated data processing' in the National Library of Medicine's Index Medicus.

Early American and European pioneers

In 1943, Black-Shafer had designed an elaborate Hollerith punched coding system for syphilis studies. In the 1947 issue of Science, Gibbs and Grass reported that they had developed mechanical devices to integrate and analyze electro encephalogram signals.

In 1949, Dr. Gustav Wagner founded the German Society for Medical Documentation, Computer Science and Statistics - the world's first professional organization for medical informatics. His work paved the way for informatics to become an integral part of the healthcare industry in Europe and around the world. As I came to understand later from my colleague and dear friend, Jochen Moehr, the Germans always used the term "informatik" -- long before the word started to be used in North America in the late seventies. Similarly, the French have used the term 'informatique' to refer to computer science and technology. In fact, as the recent movie *Hidden Figures* revealed, in the forties in North America, the term 'computer' was a job title and referred to a person (often a woman) who worked with formulae and numbers.

The earliest evidence of data processing in the medical laboratory was reported by Dr. Arthur Rappoport when he presented his experience with the "McBee manual punch card for laboratory data" at the 1952 meeting of the American Society for Clinical Pathology (ASCP).

In July 1959, publishing in the journal *Science*, Ledley and Lusted expressed the view that before computers could be used to aid the medical diagnostic process, much more needed to be known about how the physician makes a medical diagnosis. In the same year, this time in *JAMA (Journal of the American Medical Association)*, Lusted wrote that the biomedical use of computers was hampered by the lack of available machine time, inadequate peripheral equipment, insufficient funds, and a lack of coding and programming expertise.

Many computer scientists regard the Laboratory INstrument Computer (LINC) as the first personal computer. Before LINC, computers were massive high-maintenance units in multiple cabinets that filled most of a room and could only be put to work on problems by computer specialists. Led by Charles Molnar and Wesley Clark, a group of Massachusetts Institute of Technology (MIT) computer scientists and engineers decided to create an alternative: a smaller device that could be incorporated into a research laboratory and, with a modest amount of training, be put to use directly by the laboratory's scientists in analyzing data. Their first LINC computer, in 1962, provided support for neurophysiological research. Molnar was personally interested in the question of how sound is transduced into brain signals. The early LINC units helped create a revolutionary change in the understanding of cochlear mechanics.

This brief historical review is noticeably American focused largely due to my limited abilities to read non-English materials. In Germany, the Medizinische Informatik program at the University of Hannover was created in 1969 by Dr. Peter Reichertz; in 1972, one of his prominent students, Dr. Jochen Moehr, became the first Director of the Medical Informatics program at the Universities of Heidelberg and Heilbronn. Dr. Reichertz also created one of the first Hospital Information Systems in Europe in the early seventies. Dr. Jean-Raoul Scherrer led the implementation of the government sponsored DIOGENE hospital information system in Geneva in 1974.

Early Canadian pioneers

One of the earlier uses of computer technology in healthcare began in 1953, when The Professional Activity Study (PAS) of the Commission on Professional and Hospital Activities (CPHA) in Ann Arbor, Michigan, commenced collecting hospital discharge abstract data on punched cards. In the early sixties some Canadian hospital discharge data was being sent to the CPHA for processing.

The Hospital Medical Records Institute (HMRI) - forerunner to what is now our highly respected Canadian Institute for Health Information (CIHI) -- started in Ontario in 1964 and became a national organization in 1977. Two provinces opted out of HMRI, Quebec and Manitoba. Manitoba had developed medical record abstracting software of its own and ran it for many years before abandoning it in the late nineties. However, the two academic centers in Winnipeg joined the HMRI service to give them access to comparative data that was not possible otherwise. Quebec remains separate to this day.

In the early fifties, the Canadian Hospital Association, the Dominion Bureau of Statistics, and the Department of Health and Welfare developed CHAM (Canadian Hospital Accounting Manual) which became a nation-wide accounting system and an early adopter of the data

processing technology of the day. Interestingly, the term “CHAM” was introduced into the National Library of Medicine’s Index Medicus in 1951. However, the CHAM account structure proved insufficient for very large hospital centres so they expanded the structure which came to be known as CHAMII.

At St. Boniface General Hospital (SBGH), the conversion to CHAMII introduced me to the importance of committing to training and ongoing support. SBGH senior administration chose to convert to the new accounting structure so that they could capture costs much more finely. However, this change would affect the entire organization: every department would have to get a new department number and a whole set of new transaction codes. Fortunately, Tony Quaglia, the hospital’s President, recognized the implications, and made a commitment to the importance of training. Six months before the conversion was to take place, he took the second most senior member of the Finance Department, Gerry Gaudreau, and assigned him and me the responsibility of making this happen smoothly. He told Gerry that this was to be a full-time assignment for him, and he was to drop all of his existing tasks. Well, Gerry’s conversion plan included widespread training of all applicable hospital staff. It worked so well that on the day we converted, his help desk received only one call for assistance. It was amusing to hear staff say, many weeks before the conversion, “When is this finally going to happen, we are ready”. Gerry’s multi-method training program was a huge triumph, thanks to his being totally devoted to it. We learned that most other hospitals took months to settle down after the conversion; they apparently devoted fewer resources to training.

The CHAMII accounting structure eventually led to the development of the Canadian MIS Guidelines, in a process chaired by Herman Crewson, CEO of the Manitoba Health Organizations (MHO). The MIS Guidelines founded the development of statistical data in addition to financial data by proposing the development of a “Global Dimension” was in fact based on patient costing -- the intersection of clinical data and financial/statistical domains. One of the first hospitals in Canada to take up this challenge was the Royal Victoria in Montreal under the leadership of Roger Girard who would later move to Winnipeg. Unit costing is now quite prevalent across Canada and around the world and has been used to inform policy on such matters as prospective reimbursement (i.e. DRGs and CMGs) and capitation-based reimbursement most notably in Ontario. As Roger pointed out in 2019, the developments taking place in the clinical world were part of a broad effort to begin to better understand the healthcare system and to inform clinical care and system policy.

Manitoba was the first provincial “Hospital Association” to change its name to “Health Organization” to encompass more than hospitals such as Personal Care Homes. Most provinces eventually followed suit. However, with the restructuring of health care delivery into regions and health authorities in the nineties, the role of provincial hospital/health associations eventually disappeared in all provinces except for Ontario.

What is now called Statistics Canada installed their first computer in 1960 to process the 1961 census. Statistics Canada was responsible for developing one of the key datasets on healthcare in Canada, The Annual Return of Health Care Facilities – Hospitals (traditionally known as HS-1 and HS-2). It was compiled by Statistics Canada from 1932 until fiscal 1993–1994 when it was transferred to the Canadian Institute for Health Information (CIHI).

North American forerunners

Clinical information systems and electronic health records innovators

In the mid-1950's, Dr. Homer Warner began working on clinical decision support technology in the cardiology department at LDS Hospital in Salt Lake City. Dr. Warner and his colleagues developed the HELP (Health Evaluation through Logical Processing) system at Intermountain Healthcare; considered for many years to be the most sophisticated clinical information system around. Amongst other capabilities, it supported selection of appropriate antibiotics in case of infectious diseases. Their clinical decision support system also predicted and prevented many adverse drug events (ADE's) – long before commercial vendor systems did. By 1967, HELP had become a corporate-wide system and was used at most of their twenty Intermountain hospitals.

In 1961, the Children's Hospital in Akron Ohio produced a video about their new IBM 1710 iRecord hospital information system that included data collection terminals and printers on the nursing units which communicated with ancillary departments.

1962 was the year that Dr. Morris Collen started the clinical information system at Kaiser Permanente's Oakland Medical Centre. Their initial goal was to develop a comprehensive health care information system to provide an integrated, continuing patient record. Kaiser was an ideal environment to do so since it provided comprehensive care to their patients, referred to as "from cradle to grave", including ambulatory and in-patient hospital care along with all the ancillary services. For decades, the Kaiser system was considered, one the most comprehensive home-grown systems.

The Lockheed Information Systems Division was born in 1964 and run by a small technically capable, but medically naïve, group of managers, engineers, and analysts. In 1966, twelve Lockheed engineers began working with a like number of Mayo Clinic physicians; they worked for two years in Rochester, Minnesota, and developed an experimental three-terminal Medical Information System (MIS). As a result of their work, Lockheed decided to fund the development of a commercial MIS at the El Camino Hospital in California. In 1971, when development was close to being completed and an operational contract to be signed with El Camino, Lockheed ran into severe difficulties with its aircraft programs. The Technicon Corporation, which then dominated the automation of hospital laboratories, acquired the Lockheed MIS. They subsequently changed their corporate name to the Technicon Medical Information System Corporation. The Technicon Data System (TDS) went on to become famous for its 'light pen' touch screens and its CPOE (Computerized Physician Order Entry). The system was implemented in many American hospitals. There was a maximum of 20 lines/screen available with potential options. Once a 'line' / purpose / input was touched, the screen would / had to change for the next screen / option. Early systems were very screen laden (they could not really handle much in the way of multiple inputs on the same screen) and were the source of early clinician complaints. The system progressed and was still in use at El Camino until 2015, when it was replaced by the EPIC system.

As Roger Girard reminded me, the TDS system first appeared in Canada at the Foothills hospital in Calgary in the early eighties and was initially rejected by the physicians as an example of 'cookbook' medicine. It was called OSCAR and the Emergency Room doctors started wearing badges with the word OSCAR with a bar across it in their campaign to have it banned. The Canadian Medical Association Journal (CMAJ) ran an extensive article on the crusade. Eventually, the system took root and became a success when the hospital staff figured out how to deal appropriately with change management in a clinical setting. TDS7000 was still functioning successfully in 2000 when Roger was the CIO at the Calgary Health Region. It eventually became the Eclipsys Sunrise (now owned by Allscripts). The St. Boniface General Hospital replaced its aged Burroughs system with the Sunrise system in 2013; today virtually all the hospitals in Manitoba have it installed, as do the larger hospitals in Saskatchewan.

In 1965, a group of Duke physicians worked with IBM programmers to develop a system that would allow them to enter a patient's medical history, physical exam results, and laboratory data. Using that data, the system was able to suggest a diagnosis and a list of recommended treatments. That early experimental system failed to recognize many common diseases and was not implemented. In 1968, Duke gave a team led by Ed Hammond the funding to develop a working prototype of a general purpose electronic medical record (EMR). This prototype would eventually evolve into what was called The Medical Record (TMR), another one of the early home-grown, non-commercial, EMRs in the United States. In 1976, Duke partnered with IBM to build the Duke Hospital Information System (DHIS) which was marketed by IBM as the Patient Care System (PCS). In 1977, York Central Hospital outside Toronto was selected to be the pilot site as the first hospital in Canada to install the IBM PCS under the leadership of John Flint.

The idea of recording patient information electronically instead of on paper - the so called Electronic Medical Record (EMR) -- had been around since the late 1960's, when Larry Weed introduced the concept of the Problem Oriented Medical Record into medical practice. Until then, doctors usually recorded only their diagnoses and the treatment they provided. Weed's innovation was to generate a record that documented problems and how they were addressed. The revolutionary approach also would allow a third party to independently verify the diagnosis.

In 1972, the Regenstrief Institute in Indianapolis, Indiana, developed their own medical records system. Although the concept was widely hailed as a major advance in medical practice, physicians did not flock to the technology.

Based on the success of their MUMPS-based laboratory computer system which had begun in 1968, VistA (Veterans Health Information Systems and Technology Architecture) had its roots in the late seventies. VistA is still to this day considered one of the most effective home-grown clinical information systems and is being used in the 152 VA Medical Centres and 1,400 community-based outpatient clinics across the US Veterans Affairs system. However, in 2020 they began the process of converting to the Cerner system, a process they expect to take ten years.

Clinical laboratory and medical imaging innovators

At the 1962 meeting of the ASCP, Dr. Arthur Rappoport demonstrated the use of an IBM punch card system in the laboratory. Also, in 1962, Kendrew and Perutz received the Nobel prize in medicine for their studies of the structure of myoglobin and hemoglobin -- studies made possible by high-speed, general purpose digital computers.

The first American paper on Computer Assisted Diagnosis (CAD) in Radiology was presented by Dr. Gwilym Lodwick in 1962, based on work done at the Veterans Administration Hospital in Iowa City. CAD involves the development of complex models intended to simulate and improve upon human performance. It is perhaps in Medical Imaging that we have seen the greatest progress in the use of computer technology in medicine. From ultrasounds to CT scans to MRIs etc., radiologists use medical imaging to accurately diagnose and treat diseases; they also use medical imaging technologies to determine whether a therapy has been effective in patients. From ultrasounds to CT scans to MRIs, etc., radiologists use medical imaging to accurately diagnose and treat diseases; they also use medical imaging technologies to determine whether a therapy has been effective in patients. Medical imaging, analysis and diagnosis is one field where massive gains have been achieved with the growing use of Artificial Intelligence (AI).

In 1964, JAMA published the first article describing a laboratory computer system based on LINC. Several other early publications in the field were contributed by Dr. Donald Lindberg. Dr. Lindberg installed the first American electronic laboratory reporting system at the University of Missouri in 1964.

Also, in 1964, Dr. Octo Barnett started the Laboratory of Computer Science at the Massachusetts General Hospital in Boston. His intent at the time was to develop an admission discharge census system, a laboratory reporting system, and a medication ordering system. The computer hardware used was a PDP-1 (from DEC - Digital Equipment Corporation) with 16K of 18-bit word memory which supported five simultaneous users in a time-shared environment. There were no telephone line communication tariffs which could be used for data communication, but they were able to obtain a tariff for direct current telegraph communication that had been established along railroad tracks. It was from this laboratory in 1966, that the MUMPS (Massachusetts General Hospital Utility Multi-Programming System) language (still in use today) was implemented on a PDP-7.

The most heavily used hospital information system/electronic health record in the world is called Meditech and it is based on an operating system which is a derivative of MUMPS. Meditech was founded 50 years ago and the system is being used in 2,300 hospitals around the world. According to Mike Nusbaum, Meditech started as an in-house laboratory information system at UBC Hospital in Vancouver. It was championed by a pathologist, Dr. Mel Bernstein, who eventually left UBC Hospital to join Meditech in Boston. The development of MUMPS will likely still be casting its shadow on health informatics well into the future.

In light of its publicly funded health care system, Canada had a long history of interest in utilization management, dating back to 1965. Historically, interest in using a so-called

laboratory information system to aid in utilization management had been centered at the University of Ottawa and the University of Alberta in Edmonton, as well as other centers. At that time, hospital payroll and general ledger systems were outsourced to shared systems at the provincial hospital associations. The use of computers in individual Canadian facilities was generally prohibited by provincial governments, though use in the laboratory started to become an exception. With the automation of laboratory instrumentation in the early sixties, this major component of early health computing was relatively insular and essentially focused on aspects particular to that department. It is worth noting that many of the pioneers of what later became to be known as "Hospital/Medical/Clinical Information Systems" trace their roots to early research and development in laboratory automation. That is where Meditech, Cerner, and Technicon corporations all started. EPIC has its roots in the physician ambulatory care environment.

Summary of organizational beginnings

Some of the organizations and events that were created or occurred over the course of my career include:

- 1974 – 1st World Congress of Medical Informatics held in Stockholm
- 1975 – COACH
- 1976 – 1st Canadian National COACH Conference held in Ottawa
- 1977 – 2nd World Congress on Medical Informatics held in Toronto!
- 1979 - International Medical Informatics Association (IMIA)
 - established as an independent organization, separating from the International Federation of Information Processing Societies (IFIPS)
- 1981 – School of Health Information Science at the University of Victoria
- 1986 - HIMSS (Healthcare Information & Management Systems Society)
- 1987 – first Canadian industry magazine, "*Healthcare Computing & Communications Canada*"
- 1990 – American Medical Informatics Association (AMIA) – a merger of three organizations:
 - American Association for Medical Systems and Informatics (AAMSI)
 - American College of Medical Informatics (ACMI)
 - Symposium on Computer Applications in Medical Care (SCAMC)
- 1991 - Federal Task Force Report published, which lead to the creation of the Canadian Institute for Health Information (CIHI) in 1994
- 1991 – Institute of Medicine introduced the concept of the Computer-based Patient Record and recommended that by the year 2000, every US physician should be using computers in their practice to improve patient care
- 1994 – the Canadian Institute for Health Information (CIHI) created bringing together:
 - Health Information Directorate of the federal department of Health and Welfare
 - Hospital Medical Records Institute (HMRI)
 - MIS Group
 - Health Information division of Statistics Canada
- 1994 – First issue of the Journal of American Medical Informatics

- 1997 -- The Office of the Health Information Highway in Health Canada
- 2001 – Canada Health Infoway

Semantic challenges naming our new field

We have always been a semantically challenged field, in part possibly due to the rapidly evolving technology that we were working with -- new terms were needed to describe new capabilities. Unfortunately, some of the new terms were simply marketing promotions that caught on and were not scientifically based. After a few years of teaching in the early eighties, I began lecturing that there was a good argument to be made that our field should still be called "data processing". It was always entertaining mentioning that in 1957, the editor of Prentice Hall business books said *I have traveled the length and breadth of this country and talked with the best people, and I can assure you that data processing is a fad that won't last out the year.*

The "at the coalface" perspective

For those not familiar with the English expression "at the coalface", it refers to doing real work involved in a job, in real operating conditions, rather than planning or talking about it. In other words, it is a working in the field versus an academic perspective.

In the sixties we went from manual to 'data processing'. In the seventies we dropped data processing in favor of 'computing' or 'computing systems'. In the eighties we went from 'computing systems' to 'Information Systems' and 'Management Information Systems'. That was also the era when we had a great deal of difficulty naming clinically oriented information systems. Some of the terminology in vogue and thrown about was: Hospital Information System, Clinical Information System, Integrated Health Information System, Medical Information System, Patient Management System, Patient Care System plus a variety of unique names such as OSCAR, HELP, Ulticare, Vista, etc., etc. Interestingly, twenty years later "OSCAR" become one of the first open source EMR offerings, pioneered in Hamilton, Ontario, and very much in use today. In the nineties we went from 'Hospital Information Systems' to 'Electronic Health Records' (sort of from HIS to HERS).

The respected Institute of Medicine, in 1991, defined a *Computer-based Patient Record (CPR) as an electronic patient record that resides in a system specifically designed to support users through availability of complete and accurate data, practitioner reminders and alerts, clinical decision support systems, links to bodies of medical knowledge and other aids.* Even though this was a very comprehensive and splendid definition, many had difficulty with the acronym and as result a new plethora of definitions emerged. This time, in addition to the CPR, we had: Electronic Medical Record (EMR), Electronic Patient Record (EPR), Electronic Health Record (EHR), Consumer Health Record (CHR), Integrated Health Record, Patient Medical Record (PMR), Personal Health Record (PHR), Summary Care Record, etc. etc. Sadly, almost all of the other definitions excluded the notion of clinical decision support that was in the original CPR definition. As the turn of the century arrived, we switched again, and 'eHealth' became in vogue to describe the use of computer/information technology in health care. In several settings, 'Digital Health' is now the terminology of choice.

The academic perspective

From a scholarly perspective, one of the earliest definitions for “Medical Informatics” came in 1973 from Dr. Peter Reichertz of Germany who defined it to be “The science of analysis, documentation, steering, control and synthesis of information processes within the health care delivery system, especially in the classical environment and medical practice”. When I first saw this definition and others that followed it, I was struck by the apparent emphasis on medical practice. In North America, medicine referred to the work performed by physicians; yet health care delivery systems encompassed more than the practice of medicine. However, in Europe the term ‘medicine’ was applied more broadly than simply to physicians.

Our first Canadian-based definition came from Dr. David Shires of Halifax who wrote in his 1974 book *“Computer Technology in the Health Sciences”* that ‘Medical Information Science’ was “the study of the nature and principles of information and its application to the science and art of diagnosing, treating, curing and prevention of disease.” He also defined ‘Health Information Science’ as “the study of the nature and principles of information and its application within all aspects of health care delivery.”

In 1980, Dr. Morris Collen defined Medical Informatics as the “The application of computers, communications and information technology and systems to all fields of medicine - medical care, medical education and medical research.”

I entered into the fray at the 1982 American Medical Informatics Association conference when I wrote, in the spirit of David Shires, that Health Informatics was “the study of nature and the principles of information and its application and impact within a health care delivery system”. I was one of the first to use the term Health Informatics instead of Medical Informatics.

Later, the terms Nursing Informatics, Clinical Informatics, Dental Informatics, etc. entered into conversations and publications. Our very own Canadian expert, Dr. Kathryn Hannah, with the support of Dr. Marion Ball in the US and others, was a driving force in the emergence of the field of Nursing Informatics around the world.

A perfect example of the semantic challenges our field faced was the evolution of the Department of Biomedical Informatics at the University of Utah. The Department traces its beginnings to 1964 when it was established as the Department of Biophysics and Bioengineering, housed in the College of Engineering. In 1974 it split into the Department of Bioengineering and the Department of Biophysics, which relocated to the College of Medicine. In 1976 the name was changed to the Department of Medical Biophysics and Computing, and then in 1985 changed simply to the Department of Medical Informatics. In 2006 they again updated the name to its current Department of Biomedical Informatics. They granted the first informatics PhD in the US, in 1965.