The Electronic Medical Record: Is this a Digital Revolution in Health Care?

The Telmarc Group, Notes No 49

Terrence P. McGarty

The Telmarc Group - January 2009

Medical costs continue to rise faster than inflation but less than higher education. There is a commitment from the Obama Administration for some form of Universal Healthcare and control over it by the Federal Government. The articulation is not as clear as the Hillary Plan of almost twenty years ago, Obama and others seem to recognize that such an outright takings of the healthcare of the country by the Federal Government was a bit too overreaching, but it is nationalization in many ways. The entry point seems to me through what is called the Electronic Medical Record, the EMR.

We have spent a great deal of effort over the past twenty years looking at and working with electronic medical record systems. They are like puzzles, you can sole one parts while the others just sit there like unassembled pieces. They defy solution, for a variety of reasons. Our first efforts started in 1988 with a joint effort with the Harvard Teaching Hospital and Tufts Medical Center. This was an attempt to use broadband, as fast as it was then, 45 Mbps, and integrate imaging and other medical modalities into an electronic medical record. This was a holistic approach recognizing at one extreme the importance of multimedia elements and at the other the mundane issue of billing and administrative overhead.

In 1993 we prepared a detailed paper looking at the massive deficiencies of the Hilary Health Care Proposal, HHCP, and we proposed at that time what is now know as the Electronic Medical Records system. That was more than fifteen years ago. In this paper we re-look at these issues and address them in the context of the proposed Obama efforts. In the Obama case he is proposing using EMR as an economic stimulus. Albeit there has been a great deal of work performed in developing the EMR over the past fifteen years it is still far from complete. In fact we can argue that there are more issues now than ever before. It is far from a panacea and in fact if rushed and used as an economic stimulus it will have massive unintended consequences and set back good EMR efforts decades.

In this White Paper we review the Obama proposal, and discuss what EMRs are and what their deficiencies are. We also talk about how then can be used in the evidence based medicine, EBM, world as it is being introduced into medical practice. We look briefly at the iPatient paradigm, namely what has actually occurred when a large Medical Center introduces elements of EMR and how this can dramatically change the practice of the profession of medicine, most likely for the worse. Finally we assess the detailed strengths and weakness of EMR and then propose some recommendations. We believe that EMR is highly valuable, whatever it is, but that it must evolve, in a context to meet the needs of quality healthcare to the patient, not just turning the physician into a health care player of an electronic game. We deeply desire to avoid the iPatient result.

1 THE OBAMA PLAN

The incoming Obama Administration has focused on its stimulus package as one which will invest in various forms of infrastructure improvements. As Larry Summers has stated in the Washington Post[1]:

"The Obama plan represents not new public works but, rather, investments that will work for the American public. Investments to build the classrooms, laboratories and libraries our children need to meet 21st-century educational challenges. Investments to help reduce U.S. dependence on foreign oil by spurring renewable energy initiatives (many of which are on hold because of the credit crunch). Investments to put millions of Americans back to work rebuilding our roads, bridges and public transit systems… Investments to modernize our health-care system, which is necessary to improve care in the short term and key to driving down costs across the board."

It is here that we see that healthcare "modernization" has a focus in the plan. He further states:

"We expect to evaluate and to be evaluated rigorously to ensure that Washington is held accountable for how tax dollars are spent."

Of course Washington has never wanted to be held responsible for any of its decisions. It is not clear what Mr. Summers means here. With there being no definition of success or failure then there will never be a way to decide if the day or reckoning should ever arrive.

The Obama Administration has also linked broadband and healthcare. The WSJ has stated[2]:

"If that broadband network is built, Mr. Obama already knows one thing he wants flowing through the fibers: digitized, uniform medical records. On the campaign trail, Mr. Obama proposed a health care plan in two parts: Universal access to health insurance and a health care information technology program budgeted at $50 billion over five years. Obama aides assembling the stimulus plan wanted to use it to further the president-elect's policy goals. That health care IT program "perfectly fit the bill," an aide said. Unlike most industries, the country's $2 trillion health care system is clogged with paper, folders and plenty of clipboards.

[1] Washington Post, 28 December, 2008.

[2] See WSJ, Weisman, Dec 18 2008, http://sec.online.wsj.com/article/SB122956001695816413.html?mod=arti...

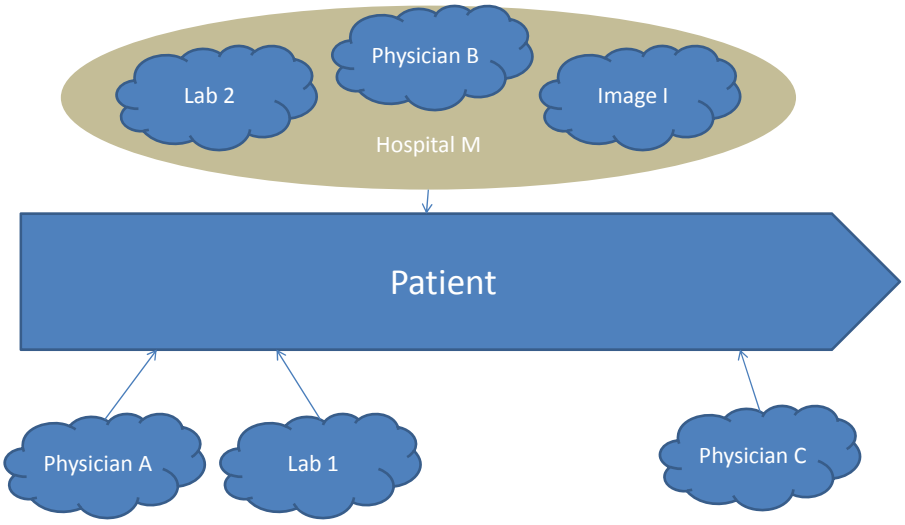
Some 90% of U.S. doctors and at least two-thirds of hospitals still rely on paper patient records, and many of those who have gone digital can't exchange the information with outside providers. The result is billions of dollars each year in administrative waste, duplicate tests and medical errors. Fixing the problem has seemed the low-hanging fruit of health reform, largely because everyone agrees going digital will improve care. But legal questions, privacy issues and the country's fragmented system of 700,000 physicians have stymied progress. Doctors have been reluctant to invest $40,000 to $60,000 on an electronic record system that may not be interoperable with other systems, especially when much of the savings goes to insurers and other payers.

Mr. Obama has said digitizing health care could save as much as $77 billion and pay for a lot of other health care reform. The $77 billion figure comes from a Rand Corp. study, however, that adds that kind of savings wouldn't likely be achieved until 2019 -- and only if 90% of hospitals and doctors are online by then."

Thus we see that the incoming Administration has proposed massive expenditures in broadband and healthcare, two areas which are dramatically different than highways and bridges. We all know how to build a bridge and the same for a highway. We have been doing these things since well before the Romans perfected them. Current bridges have a lifetime of fifty to seventy-five years; Roman bridges still function over two thousand years later. So much for progress. But broadband and healthcare information improvements are moving targets. There are no clear consensus on what the best technology should be, how to deploy it, what it will provide and the like. Thus lumping of these two with the more classic highways and bridges can lead to ultimate disasters. The law of unintended consequences will play havoc on the industries not to mention our economy.

2 WHAT IS AN ELECTRONIC MEDICAL RECORD?

Before continuing it is necessary to give some structure to the EMR. This presentation is but a single view of what it can be in a clinical setting. There are many and it is certain that there will be thousands of other embodiments but they all will have some reflection of the issues contained in this one.

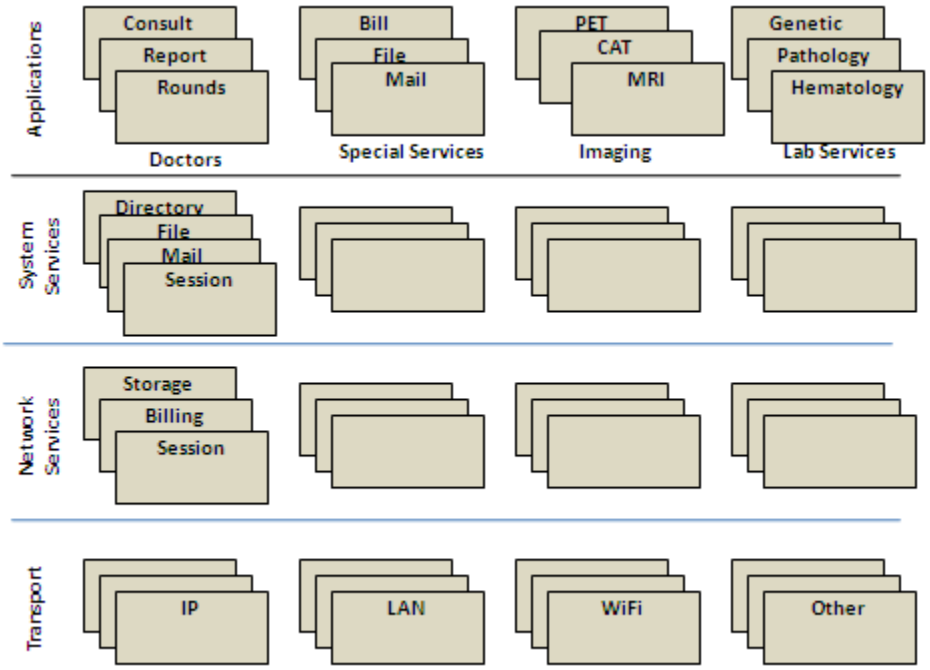


The above is a concept. But it has been implemented in bits and pieces for the past thirty to forty years, with slow but growing success. In 1988 I developed the first broadband based integrated health information system jointly with Harvard Medical School, Mass General, Brigham and Women's and Children's Hospital, as well as Tufts Medical Center[3]. The principals at the Harvard Hospital included Dr. David Margulies and Dr. Ted Treves[4]. The system was designed, implemented and deployed, using a 45 Mbps network to interconnect facilities as well as physician offices. A common record format was developed, email capabilities, storage capabilities and data retrieval was also integrated. The architecture as developed in 1988 is shown below. This is what was implemented. This is twenty years ago, using Sun and DEC work stations rather than PCs and using earlier versions of screen access and control before html and the like.

[3] See on www,telmarc.com the following publications: Image Processing in Full Multimedia Communications, Advanced Imaging, pp 28-33, November, 1990. Applications of Multimedia Communications Systems for Health Care Transaction Management, HIMMS Conference, San Francisco, CA, January, 1991. Multimedia Communications Technology in Diagnostic Imaging, *Investigative Radiology*, Vol. 26, No 4, pp 377-381, April, 1991. Multimedia Communications: Architectural Alternatives, SPIE Conference, Boston, MA, September, 1991. Multimedia Session Management, IEEE Proceedings on Communications, 1990. Wireless Communications Economics, Advanced Telecommunications Institute Policy Paper, Carnegie Mellon University, February, 1992. Multimedia Communications in Medicine, IEEE JSAC, November, 1992. Health Care Policy Alternatives, An Analysis of Costs from the Perspective of Outcomes, published, 1993.

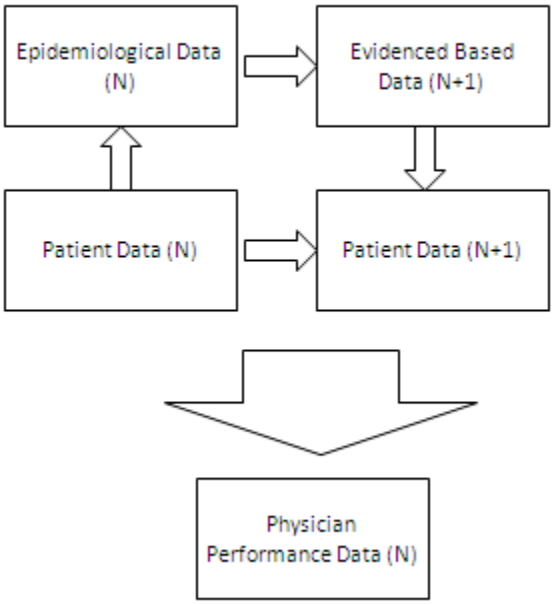
[4] David Margulies, MD, was at the time the CIO of Children's Hospital as well as an attending physician in Internal Medicine. Ted Treves MD was and remains a Professor at Harvard Medical and head of Nuclear Medicine at Children's Hospital Margulies left and became the CTO of Cerner one of the largest electronic medical record companies in the world for managing lab results.

This was a four layer system; transport, network, systems and applications. It was a fully integrated architecture with an open design. It migrated to a fully IP based platform as well. It recognized that medicine is a multimedia world, having text, images, path slides, blood work results, and the like.



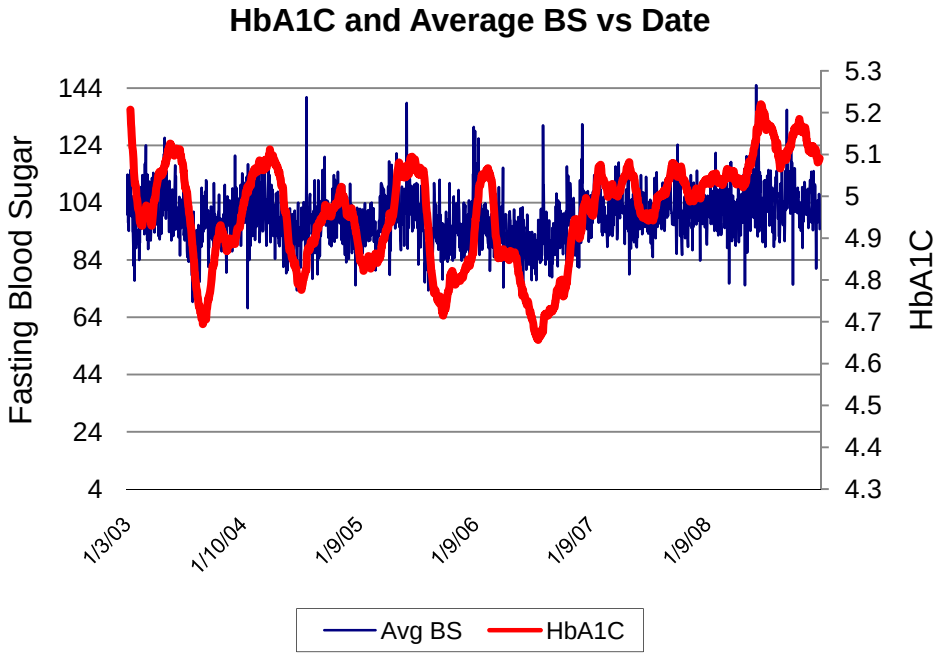
The system was implemented but it ran across many problems. The greatest was institutional blockage. There classic turf wars in any institution where one group is perceived as telling another what is best and other groups feeling that they are losing control. It ran across the problem of insurance and payment. The systems attempted to effect pre-approval of procedures and thus cut down on insurance costs. The insurance companies just balked, they wanted to apply their classic "passive aggressive" approach to health care cost containment. Then there were the legal issues; that is malpractice suits could explode if one made these records readily available. Or perhaps as some lawyers said the patient record could become fungible and changeable being in a digital form rather than in the hand of physician.

In addition there was a change in the provision of health care which this system could adapt to but



2.1 Example 1:

Several physicians have been following this patient for five years. They have had access to the patient's daily blood sugar tests, which have been electronically shared in a common EMR. Specialist to seek a consult on whether he should consider medication. His fasting blood sugar has been consistently peaking above 100 but his HbA1c is 5.2%. The concern is a pattern of increase in FBS.



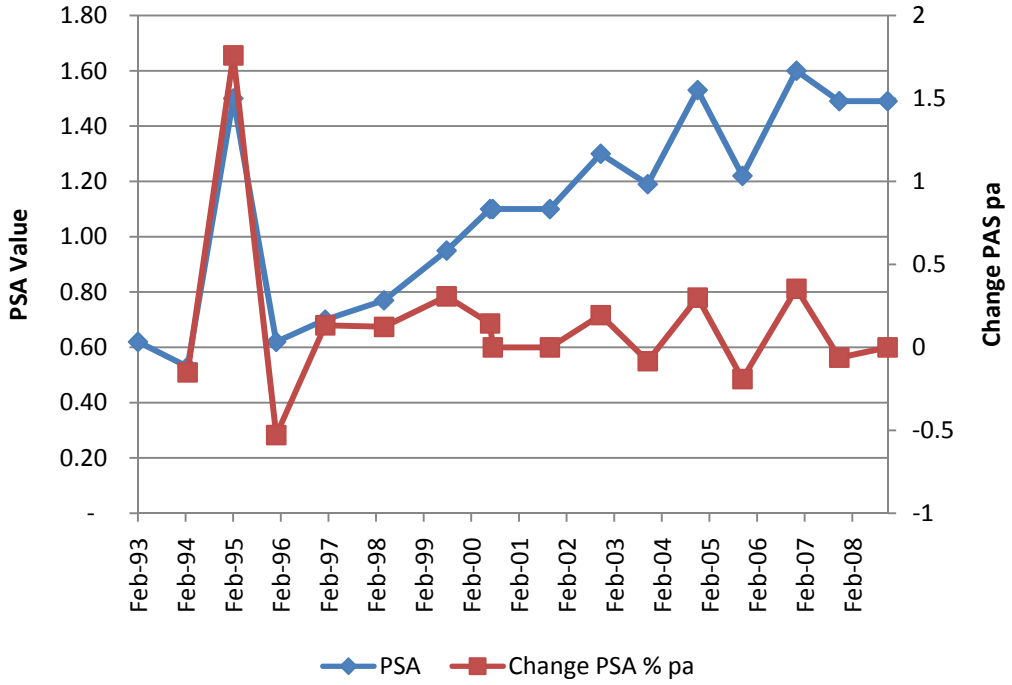
The problem presented above is that the patient must take blood sample twice a day, every day, and the results must be recorded in the patient record and reviewable by the physician. It also must become an input into what we see as the bases for Evidence Based Medicine. The patient has treated his Diabetes by diet and exercise and has for a period of six years kept the HbA1c well below 7. However there appears to be an increasing trend and should the primary physician look more closely to see if this is addressable by stronger diet and exercise controls or is this evidence of the recurrence of T2 Diabetes returning, which is assumed to be a matter of course in the long term.

This patient presents a case where real time data collection can assist. T2 Diabetes can be "cured" in over 90% of the cases by diet and exercise alone. In fact the use of drugs like metformin and insulin may exacerbate other conditions. The positive feedback of daily results may provide a behavior modification which effects better compliance without drug use. The result is dramatically lower costs by not using drugs and not resulting in any secondary effects such a kidney failure or heart disease.

2.2 Example 2:

A patient whose father died of a very aggressive form of prostate cancer at 79 has been followed by several physicians for fifteen years. The PSA has gone from 0.6 to 1.45 over that period and there have been several years with percent jumps which have well exceeded the 25% per annum change which would normally warrant a biopsy. Should

this patient proceed to an ultrasound and subsequent biopsy, which percent guideline recommends or should the patient have watchful waiting[5].



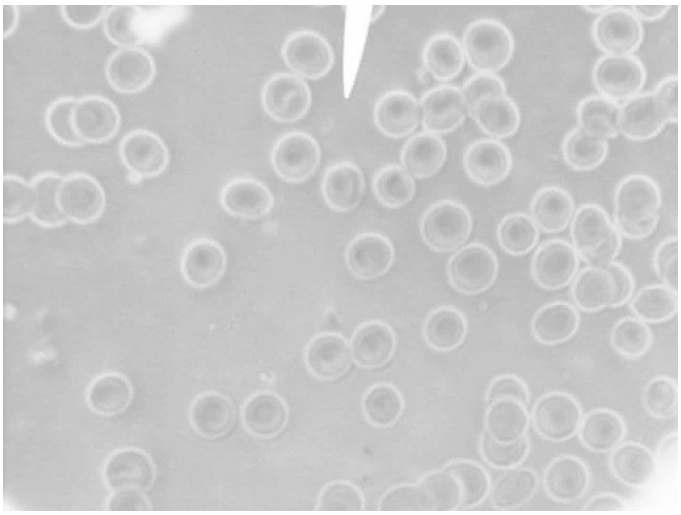
This example demonstrates the usefulness of having long terms data available on a patient and having the changes also available. Prostate cancer is most often noticed in changes in PSA, namely change per annum in percent. A 25-30% change is what most of concern is. In this patient there is a large change in the mid 90s but that may have been the result of a change in test methodology. Since the patient was young and since the PSA value was low, this was neglected. It showed a reduction the following year. However it has been increasing somewhat on a trend since 1996 going from a 0.6 to the current 1.4. However it has been relatively stable for four years.

2.3 Example 3:

A fifty year old female patient arrives at the Emergency Room with lower right quadrant pain, afebrile, and is in no other distress. She has been a patient at this Hospital before so that when she arrives the attending physical calls up a recent CAT scan as shown below along with the report of the radiologist taken at that time.

[5] See http://content.nejm.org/cgi/content/full/359/24/2605 for an interesting study of three treatment options.

The patient has blood drawn and the attending wants to look more closely at the morphology of the red cells, he is concerned that there may be blood loss and some anemia. The cells are shown in contrast below. The attending can manipulate this image to obtain better resolution with the facilities on the terminal in the ER. He then looks at the data on the patient count as well. He records his findings.



This is an example of a multimedia diagnosis using past and current data. It will assist the physician in targeting a closer examination of the lower abdomen of the patient.

The above three examples show several important things about the EMR. First none of them contain a physician's comments. They are all images. The first example shows how an EMR can result from patient generated data and can then be used to feedback to the patient for patient adjustment to meet the goals of the management of the disease. The second example shows the criticality of presenting long term data. All too often the

physician files reflect at best the last data point. As with the first example, fasting blood sugar is useless as a single measurement, unless severely off from the norm. It is like taking the blood pressure of a patient awaiting a potential diagnosis of cancer; it will be high! The third example is a case where having images taken at a prior time and a different location is critical. Also it shows the correlation in modalities as an integral part of the EMR. Again, there is not a single word written.

3 THE DISADVANTAGES OF EMR

There are many disadvantages with the EMR. We recount a few here. They are not at all insurmountable, and it is just a matter of time and working with evolving versions of them that will effect positive change. However one would be wrong to assume that we are at a point that just throwing money at the EMR issue will result in its solution. I am certain that there are many companies who would sell their wares claiming solutions but as we all know these solutions are as culturally based as they are technically. Frankly there are very few if any technical problems. There are however almost insurmountable cultural one at this time. Let us examine a few.

3.1 Patient Histories are Complicated

The first thing a Medical Student learns after the course work is taking a patient's history. This is a ritual of passing, from learning to listening, not just asking questions and getting rote answers, but seeking out from the patient what the real problem is. The patient typically arrives with a sense of dread, no matter what the problem is, they have most likely aggrandized the problem into the potential of a serious one, and the physician is seeking to look through this detail and obtain a better understanding of what the true problem is. Thus the eliciting of information in this manner is not always readily amenable to a computerized system.

3.2 Electronic File Cabinet versus A Searchable Data Base

One approach to the EMR is just taking the patient record and storing it in an electronic file cabinet. That is possibly a pdf file and then keeping it so that at some future time it may be extracted and reviewed. The second if the searchable file database. In this case one asks the patient questions and enters a pre selected set of answers. In fact the patient may very well not need a physician to even go this far. At one extreme we keep what has been done all along and just digitize the result and at the other extreme we enter the data in a digital form ab initio.

3.3 Data Versus Patient Information

Having access to the patient, looking at, talking to, listening to, performing certain maneuvers on the patient to test for certain response is critical. Using the EMR terminal by itself after ordering tests and making all decisions at the point of the terminal, most likely because of its apparent efficiency, can result in diminished patient care caused by not seeing certain artifacts of the patient and the disease evident only through observation. Neurological disorders are typical. The neurologist looks at a patient differently than an internist. The Internist looks at a patient using the eyes of a differential diagnosis; what are the possible disorders given the presenting symptoms and then eliminate those that do not fit. It is a process of elimination. The neurologist looks at the patient to ascertain where the neurological fault is, the spine, the limbs, the mid brain, the hypothalamus, the cerebellum, the frontal lobe. Then and only then does the neurologist tries to find out what may be causing the defect. Information on the patient is not all found in the data record.

3.4 Multimedia Issues

There are in medicine many multimedia studies which are complex but critical to the patients diagnosis and care. Many of these are imaging such as CAT, PET, MRI and all variants thereof. We have shown the multimedia elements in some of our previous examples. Imaging and hematological results can be accessed directly but they must also be processed, enhanced, compared, correlated, and commented upon, and then they in this form must be actionable in terms of patient care. Finally the multimedia world will result in massive volumes of storage. Consider the following examples:

Multi-Slice CT or Volume MR	>1000 images, 1024*1024*2Bytes,>2 gigabytes/ Study
User-Friendly Ultrasound - Volume	Laptop/Handheld/PDA, 3D, 128 x128 x 32, But…>20images/sec
PET/CT, SPECT/CT	More agents (C11, O15, NH3 -> function, staging, guide Rx
Multimodality Image Fusion	
Optical Imaging	
CAD	Extend techniques from Mammo ,Lung, Vascular, Neuro

There are trends seen in these systems[6]:

- Workstations will become intuitive customizable multimodality platforms
- Individual imaging specialists will be "served" with more information automatically based on the individual examination
  - Clinic or ER information
  - Results of relevant lab tests
  - Current and Prior relevant images presented according to preferred display protocols
  - Images already fused
- Images and reports will become a routine and integral part of the electronic medical record
- On-line decision support will be easily available to the imaging specialist
- Reporting will become richer
  - Voice
  - Text
  - Text overlays
  - Pointers

Applications include:

- Reporting
- Consultation
  - Rounds Image annotations including voice objects

[6] From Dr Ted Treves, Children's Hospital, Boston, and Harvard Medical School. Personal Communications January 2008.

- Interactive consultation (i.e.: sharing a pointer and voice with another physician on-line (or off-line by means of multimedia objects: image voice and text)
- Joint reporting by more than one imaging specialist

However meeting the challenges of these trends is quite difficult. Many entities are working on the complexity of the multimedia challenge and have been doing so for two decades. I taught the first course on Multimedia Communications in 1989 at MIT. It was a first step and the main concern was the philosophy of what we were doing more than the technology. I started out assuming it was a simple technical problem but after some thought it was clear that the old Marshall McLuhan phrase that "The Medium is the Message" would clearly play its part. One must be careful than what the message becomes in an EMR system.

3.5 Integration of Data Elements

Integrating text, time data, images, lab results, and pathology results, electro testing (cardiology, neurology and the like) into a single searchable and presentable record is no mean task. The EMR is not just an electronic file cabinets. If that is the paradigm then the result is useless.

3.6 Retrieval and Correlations

How the data is stored, retrieved and correlated is a non trivial problem. First is the amount of storage and it accessibility. The second and truly most critical issue is the searchability of these records[7]. How does the EMR deal with searching across complex multimedia objects? Take a CAT scan; it may consist of 75-90 slices, each containing some information. The disease process may be best articulated on slice 57, for example. That may be on the radiologists report. That is most likely searchable, but it must readily tie into the CAT scan images and the remaining images must also be searchable.

3.7 Networking and Sharing

Sharing the data is a very complex networking problem. There is the intra-institutional and the inter-institutional issues. Within a teaching hospital, for example, there is the attending and consults, the labs, the path, the imaging, and added to this is the admin

[7] Of course one could try the Data Warehousing approach which is just dumping all the data in one heap and then sorting thru it after the fact as suggested by Teradata, see http://www.nytimes.com/2008/12/29/technology/29hewlett.html?_r=1&adxnnl=1&ref=business&pagewanted=print&adxnnlx=1230558491-g2vD5ie88HtwfdwEakudxQ Yet if one has the opportunity to start afresh then one should at least try to get it right from the beginning.

and the billing, not to mention all the residents wandering through the process. Thus there are many forms of multi-media data; image, slides, new and old, voice and text, scanned paper, EKG, and ultrasounds, and the list goes on. Physicians want to see the CAT as well as read the report. They want to see the CAT and ultrasound and have the lab work and not just rely on the repots.

3.8 Histories and Profiles

Physicians also want to see the history. Disease is a process of change from a norm. The first part understands the norm and the second part is managing the change. Spots on the lung may not mean anything is they have been there for twenty years. PSA of 4.5 may also not be a serious concern if it has been that for twenty years, assuming the same test procedures are used. Thus networking and sharing in a spatio-temporal context will be a key element. This means inter-institutional and stored for indeterminate periods of time.

3.9 Security and Privacy

The HIPPA laws place great restrictions on patient data. For example it requires faxing and prohibits email[8]. Now that may have been fine in 19965 but it is absurd in 2009. There is the strain between patient medical records privacy and the need to share information between medical professionals and even back to the patient themselves. Finally, the HIPPA rules have become a straitjacket on the development of medical information systems, because all such systems must be HIPPA compliant. Patient information privacy is a true essential if there is to be any trust in the medical system. Yet access to information by those studying the efficacy of drugs, the performance of medical institutions and professionals, the expansion of an evidence based medicine, all rely on having a broad based access to records, devoid of patient information. Yet there is the conflict that a patient's medical file, exclusive of the patients direct personal information, may in and of itself be enough information to identify patients, it may be akin to a fingerprint in its uniqueness. There will always be a conflict between privacy and the need for more open access to non-patient identified information.

3.10 Litigation

There is still the problem if litigation. The physician has now a massive amount of information before them and in addition the physician may also have, or should have, then EBM information as well. Has the physician taken the correct next steps, and if not and if harm ensues to the patient, there now exists a detailed trail in electronic

[8] See http://www.hhs.gov/ocr/hipaa/

documents and actions that may or may not reflect the actual process. It opens many new doors for mal practice litigation, based upon what the physician should have done, given the time available.

3.11 Time Constraints

Data must be both current and immediate. Lab results when requested must be made available in a timely manner. Imaging studies must also fit that example. Pathology results likewise must fit.

4 EVIDENCED BASED MEDICINE AND THE EMR

Evidenced Based Medicine, EBM, is a recently new approach wherein each procedure used in diagnosis and treatment is now given an assessment based upon the degree to which it has been shown in standardized medical trial to be efficacious or not[9]. Thus based upon various clinical trials the techniques used for example to determine if a patient has appendicitis are examined and then are classified as to how effective they may be in determining whether it is truly appendicitis. Considerations such as the specificity and accuracy of certain procedures and then the effectiveness of certain treatments and even the effectiveness of certain preventive measure are considered.

Younger physicians are now more frequently trained in the EBM approach and they all too often may question an experienced physician as to what basis they have used to make the diagnosis or assert a treatment. EBM is in a sense a more scientific method of practicing medicine and in certain ways it is a way to practice which may help to avoid litigation. However it can become a straight jacket if applied excessively for many problems have yet to be studied using this approach.

However the use of the EMR can potentially create a massive data base which in turn adds to the underlying elements of EBM. The EMR if statistically valid and if applied appropriately can become the main drive in an EBM paradigm.

5 THE IPATIENT SYNDROME

However, with the combination of a workable EBM using EMR on a national basis and adding to this the demand to interact with the data, qua data, and actually qua disease, the physician may lose contact with the patient. A hundred years ago, when physicians visited patients and when physicians walked the wards of hospitals, such things as

[9] See Simel, D.L., D. Rennie, The Rational Clinical Exam, McGraw Hill & JAMA 2009.

looking at the patient, listening to the patient, even smelling the patients urine were common place. The old adage was "If all else fails listen to the patient…." for sooner or later the patient will let you know what is wrong. However the EMR and EBM approach sets the patient to the background, tests are processed, results are entered, and the summary and even detail are made available on the monitors. These monitors reside in the physicians room on the floor and in many ways the new young physicians sit and look at the data, look up references in the medieval literature, scan for the use of other tests and data and in many ways reduce the patient to a far off element of this process, like a router in a large IP network supporting the Internet, distant, possibly malfunction, but it can be pinged with various tests to see what is wrong with it. The patient has been turned into an iPatient.

Dr. Verghese, from Stamford, has recently written a superb piece in the New England Journal of Medicine, NEJM, on the use of EMR at the Stanford Hospitals. In many ways it is most likely the same at other Tier 1 Medical Centers, albeit with some changes. From the NEJM Verghese states the following[10]:

"On my first day as an attending physician in a new hospital, I found my house staff and students in the team room, a snug bunker filled with glowing monitors. Instead of sitting down to hear about the patients, I suggested we head out to see them. My team came willingly, though they probably felt that everything I would need to get up to speed on our patients — the necessary images, the laboratory results — was right there in the team room. From my perspective, the most crucial element wasn't…..

Still, the demands of charting in the electronic medical record (EMR), moving patients through the system, and respecting work-hour limits led residents to spend an astonishing amount of time in front of the monitor; the EMR was their portal to consultative teams, the pharmacy, the laboratory, and radiology. It was meant to serve them, but at times the opposite seemed true…..

The other way — call it the expedient way — is not formally taught, and yet residents seem to have learned it no matter where in the United States they trained. The patient is still at the center, but more as an icon for another entity clothed in binary garments: the "iPatient." Often, emergency room personnel have already scanned, tested, and diagnosed, so that interns meet a fully formed iPatient long before seeing the real patient. The iPatient's blood counts and emanations are tracked and trended like a Dow Jones Index, and pop-up flags remind caregivers to feed or bleed. iPatients are handily discussed (or "card-flipped") in the bunker, while the real patients keep the beds warm and ensure that the folders bearing their names stay alive on the computer.

[10] NEJM N Engl J Med 359;26 www.nejm.org December 25, 2008 **Culture Shock — Patient as Icon, Icon as Patient,** Abraham, Verghese, M.D.

The problem with this chart as- surrogate-for-the-patient approach is — to quote Alfred Korzybski, the father of general semantics — that the map is not the territory. If one eschews the skilled and repeated examination of the real patient, then simple diagnoses and new developments are overlooked, while tests, consultations, and procedures that might not be needed are ordered. "

He uses the term iPatient, because the use of the technology moves the physician more and more in front of the screen, making the patient at best a small part in the process of providing medicine.

6 PAST POLICY POSITIONS

In our 1993 paper regarding the issue of the Hillary Health Care Plan, we laid out five issues we felt were important in developing policy. We restate them here since frankly little has changed in sixteen years.

" To develop the policy issue we pursue a five point analysis. Specifically;

Epidemiological: First we review the epidemiological factors in this process. The demographic base of health care consumers if one of these elements. The second element is the distribution of diseases in this population. The argument made in this paper is that it is the demographic and disease profile that drives the entire process and not the unit costs., The unit costs are a reflection of internal operational efficiencies or inefficiencies.

Measurement and Management: Having established the basis of diseases and demographics as the ultimate driver, we then demonstrate how this can be measured on a micro basis and how this measurement process can be tied to quality of care delivery. We argue that price control is not the issue. Efficiency, productivity, and quality of care are the factors. We further argue that to better understand the direction to go in restructuring the HealthCare establishment it is necessary to do so in a fashion that ensures quality care. To provide quality care and in turn gains in productivity requires a paradigm shift in measurements regarding the results. This is a critically new mode of observation.

Technology Factors: Technology is the enabling agent for introducing productivity changes. The current approach to HealthCare is highly fragmented and there is a great deal of criticism of the technology that is applied. We develop a technology policy direction and provide three cases for study of how a totally integrated technology system and approach can achieve significant productivity gains.

Operating Cost Elements and Control: The epidemiological elements of the study show where the drivers are for the HealthCare field. The cost elements show where the

expenses are going. The approach is to drive down the drivers as inputs to the HealthCare system, and to then also reduce the unit costs through productivity. Having shown the impact of technology, we then, in this area, develop a broad set of rules for the management of the cost side. Again, measurements and management of the quality of care and the process of care is the key element.

Policy Implications: Herein lays the most difficult choice to proceed. Policy relates to who gets what and who pays for what. We first develop a philosophical alternative base for the delivery of HealthCare. It is essential to understand what the underlying world view is that we are using in approaching HealthCare and from that see if committing world views lead to the same results. We develop an approach to policy development that uses the deconstructionist approach taken in other areas.
To develop the policy issue we pursue a five point analysis. Specifically;

Epidemiological: First we review the epidemiological factors in this process. The demographic base of health care consumers if one of these elements. The second element is the distribution of diseases in this population. The argument made in this paper is that it is the demographic and disease profile that drives the entire process and not the unit costs., The unit costs are a reflection of internal operational efficiencies or inefficiencies.

Measurement and Management: Having established the basis of diseases and demographics as the ultimate driver, we then demonstrate how this can be measured on a micro basis and how this measurement process can be tied to quality of care delivery. We argue that price control is not the issue. Efficiency, productivity, and quality of care are the factors. We further argue that to better understand the direction to go in restructuring the HealthCare establishment it is necessary to do so in a fashion that ensures quality care. To provide quality care and in turn gains in productivity requires a paradigm shift in measurements regarding the results. This is a critically new mode of observation.

Technology Factors: Technology is the enabling agent for introducing productivity changes. The current approach to HealthCare is highly fragmented and there is a great deal of criticism of the technology that is applied. We develop a technology policy direction and provide three cases for study of how a totally integrated technology system and approach can achieve significant productivity gains.

Operating Cost Elements and Control: The epidemiological elements of the study show where the drivers are for the HealthCare field. The cost elements show where the expenses are going. The approach is to drive down the drivers as inputs to the HealthCare system, and to then also reduce the unit costs through productivity. Having shown the impact of technology, we then, in this area, develop a broad set of rules for

the management of the cost side. Again, measurements and management of the quality of care and the process of care is the key element.

Policy Implications: Herein lays the most difficult choice to proceed. Policy relates to who gets what and who pays for what. We first develop a philosophical alternative base for the delivery of HealthCare. It is essential to understand what the underlying world view is that we are using in approaching HealthCare and from that see if committing world views lead to the same results. We develop an approach to policy development that uses the deconstructionist approach taken in other areas."

7 CONCLUSIONS AND RECOMMENDATIONS

The following are several conclusions and recommendation based upon the analysis performed above.

7.1 EMRs have Value

Cleary the EMR, in its broadest sense, has and will continue to have substantial value. It can be a mechanism for ensuring patient health, collecting data on procedures and drug efficacy, looking at real time epidemiological trends, and monitoring and managing the patient.

7.2 EMRs Must be Designed to Ensure Patient Care

The tale of the iPatient at Stanford is a telling description of how the EMR can take the physician away from the patient and hinder patient care rather than improve it. It dehumanizes the patient and makes the patient an elements in some data collection network which then needs the full time care and attention of the physician, feeding the system with mouse clicks and key board entries.

7.3 EMRs Must be Developed Over Time; They Must Evolve

The EMR is at this point still a gestalt. It has embodiments in many forms, most meeting the needs of specific institutions and practices. There is nothing wrong with this approach; in fact given the complexity of the problem there most likely is no other reasonable approach.

7.4 Throwing Money at EMRs is Just Wasting Money

The proposal by the Obama Administration to effectively throw money at the EMR issues is just a waste of money. It is akin to buying a fully restored 1965 Ford Cobra for a nine month old. The infant cannot walk and more than likely is not toilet trained. At worst the child will crash the vehicle if the child can even make it work and at worst the child will just soil the seats. The EMR is not defined, it is not mature, there is no accepted common architecture, not way to deal with all the issues and the isolated use may very well add burdens to the process of medical care to ensure that the iPatient become the norm.

7.5 Improper Use of EMR and Too Rapid a Deployment May Increase Costs and Increase Mortality and Morbidity

Rushing anything, especially something which has the ability to change a great deal about the way medical is practiced and delivered should be paced and measured. The law of unintended consequences continues to hang over our heads. It is clear that if the physician becomes a slave to the screen then the patient will be given short shrift. This in turn will lead to increased morbidity and mortality.

7.6 The US Government Should Play No Role

Just think of the FAA and the continual mess that the Air Traffic Control system has been in for decades. The US Government has never demonstrated any great competence in developing any high technology systems Even DoD has abandoned a great deal to buy "off the shelf" equipment except when it is for a specific weapon system, and then is takes ages and costs trillions. Can the Healthcare community handle this on their own, perhaps, but this is clearly a problem that has tremendous human factors issues. It is reliant upon employing a great deal of what has been developed in the commercial market and then putting it together into an architecture to meet the needs. It is iterative, and the timing on the iterative process must remain short.