Healthcare Systems Process Reengineering (HSPR)

I: Vision

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Abstract

One feature of the continuing and unsuccessful efforts for healthcare reform in the US has been the failure of physicians to lead in articulating a new vision to deal with the perceived problems: that healthcare costs too large a portion of the GNP and of the Federal budget; that despite the high cost the general quality of care is not high compared to other developed nations; and that too large a portion of the population cannot afford even adequate care. The medical community has largely been reactive, so although change has been inexorable it has been driven by insurers rather than by providers or consumers.

This paper contributes towards a new vision — Healthcare Systems Process Reengineering (HSPR) — in which physicians take leadership, in cooperation with other health providers and with employers, insurers, community organizations, and government agencies. A healthcare system need not be a single business; it might simply be a voluntary organization of independent providers. If healthcare systems are to be successful, even at providing health, they need to be sensibly integrated into the economic life of the community.

The underlying ideas are partly modeled on those of Business Process Reengineering (BPR) as set out in the book by Hammer and Champy, whose position is that monolithic, rule-bound, businesses, organized by function in specialty departments with restricted intercommunication, will not be able to survive new competitive challenges. Those best prepared are ones looking instead at the processes whereby they can add value for the consumer. These processes need redesign to be under control of case managers able, and structurally motivated, to follow them through longitudinally, coordinated from the customer’s point of view.

For healthcare, this process is long term health for individuals. Several observations seem clear. First, consumers have to be enlisted as active partners in, not passive recipients of, health care. Second, although specialty and functional divisions are convenient for providers and foster depth of knowledge and technique, by themselves they are largely counterproductive of long term health for the consumer. If a COPD patient is hospitalized, we are concerned with how well the hospital does its job, but later it is more important to ask how the system could have staged previous care to have avoided hospitalization and, more, to have prevented smoking. Third, being able to provide longitudinal care means being able to provide the whole system of specialty services that a consumer may need. Providers need to organize to do so if they are to compete with managed care systems. Fourth, the logical candidate to be an individual’s case manager is his primary care physician. Managed care organizations have been correct in seeing the need for someone to provide oversight, but fatally incorrect in filling this role with people not having the education, the ability to deviate from corporate rules, or the motivation, to see that patients do well. Fifth, informatics is a fundamental infrastructure that can provide communications, allowing coordination of diverse providers, and provide data structures and analytic tools for longitudinal patient histories, allowing planning and evaluation.
Introduction

One feature of the continuing and unsuccessful efforts for healthcare reform in the US has been the failure of physicians to lead in articulating a new vision to deal with the perceived problems:

- that healthcare costs too large a portion of the GNP and of the Federal budget;
- that despite the high cost the general quality of care is not high compared to other developed nations;
- and that too large a portion of the population cannot afford even adequate care.

The medical community has largely been reactive, so although change has been inexorable, it has been driven by insurers rather than by providers or consumers.

This paper contributes towards a new vision of healthcare systems in which physicians take leadership, in cooperation with other health providers and with employers, insurers, community organizations, and government agencies. The ideas in this paper are only a first draft: they need interdisciplinary work in order to make them practical.

A healthcare system need not be a single business; it might simply be a voluntary organization of independent providers.
The reality of clinical practice in comparison to some simple prescriptions that have been given for it

The first reality of clinical practice is that it is complex and contains many different realities. Diseases differ.

- A disease like tonsillitis suggests a simple model of clinical practice in which there are three neatly separated phases — diagnosis, treatment, and afterwards —, each with uniquely correct answers.
- Other diseases are more complex. Chronic Obstructive Pulmonary Disease has no afterwards. Its standards of possible success are different: we can only hope to make the patient more comfortable and to prevent or delay further degeneration.

In many cases it is more appropriate to speak of patients, rather than of diseases. A patient presents with a set of symptoms. He also presents with a history that colors our interpretation of the symptoms and limits our choice of therapy. We may diagnose more than one chief complaint. We may not be able to settle on a definitive diagnosis before we need to initiate therapy. Rather we have a differential diagnosis from which we progressively rule out possibilities, as disease, testing and treatment evolve; and perhaps it is only afterwards that we are able to rule out all the possibilities but one. In parallel with pursuing the differential, we may also be treating symptomatically and trying to maintain homeostasis in the light of physiologic law.

If a COPD patient is hospitalized, we are concerned with how well the hospital does its job, but later it is more important to ask how the system could have staged previous care to have avoided, or at least predicted, hospitalization and, more, to have prevented smoking.
**The traditional model of healthcare**

The traditional model of healthcare looks like this.

<table>
<thead>
<tr>
<th>What the practitioners in the health care system can do for you after you’re already sick</th>
<th>Everything else</th>
</tr>
</thead>
</table>

In somewhat more detail, it looks like this.

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What the practitioners in the health care system can do for you after you’re already sick

Primary Care
Hospitals
Nursing Homes
Nurses
Physical Therapy
Medical Specialty A
Medical Specialty B
Medical Specialty C

Community Health
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The problems with this model of healthcare

The object is the long term health of each individual. This is the basic process in terms of which the healthcare system can add value and that we want to re-engineer so that it is natural, easy and economical for providers to ensure end–to–end service.

Illness has a tremendous social cost:

- It hurts quality of life of the individuals involved, i.e. eventually everybody.
- There is a cost to the economy in days of work lost or in poor quality work.
- It usually is more expensive to get people well than to prevent them from getting sick in the first place.

We tend to think that these costs are being paid by somebody else. They aren’t. Directly or indirectly, we pay them.

It is a corollary of this point of view that wellness is primary: the moment a consumer becomes ill, the system loses. A further corollary then is that individuals, communities and community agencies have to be enlisted as active partners rather than as passive recipients.

In real world terms, the traditional model of health care is poorly applicable:

- The distinction between “what happens before you’re sick” and “what we can do after you’re sick” doesn’t correspond to any boundary useful to the consumer.
- Within health care, although specialization is important in providing depth of knowledge and resources, where needed, and independence among providers is important in preserving individual responsibility, these have to operate within a model that views the world seamlessly through the consumer’s eyes.
A new model of healthcare: the larger context

What is needed is a new model of health that views the world seamlessly through the consumer’s eyes rather than through the functional divisions of the health care system and that does not wait until after people are sick.

- Individuals and their communities need to take primary responsibility for their health.
- Their partners are Health Care Providers, Employers and Government Agencies.

This amounts to a fundamental change in the way health is provided.

What would be the role of healthcare providers in this model?

Let’s first back up and look at the theory of Business Process Reengineering and then try to see how it could be re-applied in healthcare systems.
Business Process Reengineering

While many providers take an idealistic view of their profession, it is clear that if healthcare systems are to be successful, even at providing health, they need to be sensibly integrated into the larger economic life. In particular, they need also to be successful as businesses. There has to be a comprehensible, fair, and affordable way for individuals, in the context of their community, to purchase and pay for healthcare.

In their classic book *Reengineering the Corporation: a Manifesto for Business Revolution*, Michael Hammer and James Champy set out the principles of Business Process Re-engineering (BPR).

The object is to achieve order of magnitude improvements in quality of service and in cost by identifying the basic process whereby a business provides added value to the consumer and then radically simplifying that process so that it is supervised by a case manager or small case team with incentives and responsibility for end-to-end delivery.

This is to replace the older, fragmented model we are familiar with. In this model nobody is really responsible for the whole chain of events that needs to take place in order actually to deliver goods and services to satisfied customers.
A BPR example from industry

(From pp. 45-6 of David Vaskevitch, Client/Server Strategies. IDG Books, San Mateo, 1993.)

**Story:** A small customer ordered some products from his salesman, specifying next-day delivery; the customer needed the product for an installation scheduled the day after that. The salesman promised to meet the request and drove specially to his office to enter the order. Like always, the order was processed through four different departments. In spite of being marked “urgent” and requiring next-day delivery, the order made it through only two departments the first day. On arriving at the third department, the shipping scheduler interpreted company policy narrowly and decided the order wasn’t big enough to warrant expedited delivery. The fourth department, responsible for (among other things) customer satisfaction, realized that the terms of the order had been altered, but because of the small size of the order elected to notify the customer by regular mail. The result? Three days after placing the order, the customer was notified by mail that his order would arrive the following week as part of a regular shipment. One set of rules interpreted consistently resulted in one less customer to worry about in the future.

**Solution:** Today the company has shut down almost all of its physical sales offices. Each salesman has been provided with a notebook computer equipped with a cellular modem. The savings associated with shutting down the sales offices allowed the company to grow the sales force by 5 percent while still reducing the net sales cost by 3 percent. Best of all, each notebook computer contains an order processing application that understands all the company’s key business rules. The notebook communicates with regional servers that manage inventory, schedule shipments, and can commit to guaranteed delivery dates.

Each salesperson has both a sales and a profitability target for his or her own territory and customer base. Each decision to expedite a shipment, each decision to honor an unusual return request, and each potential exception to the default rules can be evaluated on the spot in terms of its impact on profitability. Of course, the salesperson can make his or her own subjective judgment about the impact on future sales. Best or all though, when the salesperson promises next-day delivery, the promise has value and meaning.
What this industrial BPR example shows

- In order to produce value for consumers (and therefore stable profitability for the business) each process that the customer sees needs to be placed under the control of a single case manager (or, exceptionally, a small case team) responsible to supervise that process from beginning to end.
- In fragmented, task-oriented, businesses, good performance statistics do not necessarily mean good customer satisfaction or even good profitability. These statistics only indicate how many cycles the staff goes through, not how much value is produced.
- Similarly, the centralized, inflexible, rules that these older organizations use to ensure accountability do not necessarily produce profit.
- Reengineered organizations can allow individual case managers to make flexible, context-dependent decisions that maximize the joint benefit to the customers and the business. They can allow this freedom, while still ensuring accountability, by holding the case managers to overall, rather than case-by-case, measures of performance.
- The way to ensure that both sets of goals, customer satisfaction and corporate accountability, are met is not by issuing rules but by directly reflecting them in the reward, reporting, and QA structures.
- Informatics is a fundamental infrastructure allowing staff to cooperate in the ways needed.
Healthcare Systems Process Reengineering (HSPR)

The fundamental process that the healthcare business is about is the long term health of individuals in the community: keeping them disease free, rapidly and effectively resolving illness when it does occur, and slowing the progression of degenerative diseases. If we can provide, and document, this service — longitudinal health for individuals — we can prosper in an era where health care is increasingly purchased in quantity by employers with an interest in using their fringe benefit dollars to protect the productivity of employees and the well being of their families. This kind of end-to-end service cannot be provided by hospitals or physicians acting in isolation: it can only be provided by systems delivery of a variety of services centered on the customer’s needs. These providers need not be part of the same organization, but they must have the means and the incentive to cooperate.

Health care has been organized around the specialty divisions among individual providers and among providing organizations. Health Maintenance Organizations have, in principle, a powerful organizational advantage over isolated providers in that they control a diverse system of providers delivering a longitudinal program of care to individuals. The fact that care has longitudinal follow-up means

- that care plans with good long-term outcome can be formulated and assessed;
- that quality of care can be documented and marketed to employers;
- and that prevention and wellness have a logical, and financially strong, place in the system.

In practice, however, HMOs may lack the computational infrastructure and, sometimes, also the vision to pursue these advantages farther than immediate market forces demand. The result may be managed care, often only a euphemism for indiscriminate cost cutting.

The logical candidate to be an individual’s case manager is his primary care physician. Managed care has been correct in seeing the need for someone to provide oversight, but fatally incorrect in filling this role with people not having the education, the ability to deviate from corporate rules, or the motivation, to see that patients do well.
Comparison with Managed Care

The goals of HSPR are like those often stated by proponents of Managed Care. They emphasize
- prevention and wellness,
- a high quality of clinical care,
- and containment of costs.

Although the goals are similar, one may well ask whether the reality of present Managed Care organizations amounts only to blind denial of services in the name of cost cutting. We propose methods that are quite different, that we argue are more likely to deliver on promises, while leaving the social fabric of providers and of patients more intact.

- Where Managed Care manages cases using centralized rules administered by clerks with little discretionary power, we propose case management by primary care physicians using professional judgment.
- Where Managed Care enables system control by applying requirements inflexibly to each and every case, we propose to control outcome and cost by applying requirements (determined by provider peer groups and formulated in terms of the goals rather than the methods of treatment) to groups of similar cases, leaving the primary care physician and consulting specialists latitude to resolve the vagaries of individual cases in the light of their actual context.
- We propose using valid statistical principles to allow for the effect of random variability in the outcome of the small number of cases seen by providers in disease groups that are narrow enough to be reasonably homogeneous.
- We propose using information technology to allow providers meaningful longitudinal follow-up and to enable collaborative specialty referrals. The database that supports this activity will also support documented quality assurance by peer review.
The role of medical informatics

This new model of healthcare requires coordinating the activities of all the disparate elements involved, and doing so poses a difficult systems problem.

The role of the HSPR software is to provide the fundamental enabling communications, information and knowledge engineering infrastructure that will enable the partners in this new model of health care to work and to work together.

The HSPR software will provide three sorts of services.

- Access to health information.
- Data and analytic tools that enable the partners to visualize clearly and to assess the joint effects of the factors shaping their decisions.
- Means of communication allowing the partners to carry on high-level dialog, using the applications and the data repository, and to share responsibility in following plans and outcomes longitudinally.
**Informatics services to providers**

Where others have proposed defining treatment by guidelines and clinical pathways, we recognize

- that these are applicable only to a limited number of cases with simple structure,
- that their empirical support and their acceptance among providers are limited,
- and that variation by individual practitioners is the only possible source of correcting current mistakes and making progress.

Applying such rules universally is counterproductive.

We further note that it is easier for providers to agree on standards for diagnosis and for goals or therapy than on methods of therapy. Therefore, it makes the best sense to use informatics to support diagnostic procedures and therapeutic reasoning.

We propose a comprehensive variety of techniques, applicable in different circumstances, for supporting the health care provider, techniques that are permissive and enabling, rather than confrontational and disabling. We will offer providers CME, tools for decision support, statistical analysis software, physiologic calculations and models, and intelligent search tools for literature references and a library of past cases.
A case study from the future: Geraldine

Geraldine is a 72 year old widow with emphysema. Her children both live in other cities. She sees a primary care physician, Dr. Jones, an allergist, Dr. Ikubu, and a chiropractor, Dr. Lin. She lives at home, and is visited regularly by a social worker, Mr. Garcia, who, along with other social services, helps arrange for housekeeping help for her.

Geraldine, retired, still carries BC/BS coverage partly subsidized by AcmeCorp, her former employer. She also has Medicare.

She belongs to the Better Breathing Club, a local group working to educate its members in prevention and self care and in better interaction with the health care system. The Club also works to improve health care and environmental conditions related to respiratory illness. It maintains an HSPR web site as part of both of these programs. It is pivotal in allowing seniors with respiratory problems to stay independent as long as possible, which respects the dignity of these people and also helps hold down total health care costs.

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Drs. Jones, Ikubu, and Lin, and Mr. Garcia all belong to GoldCare, a network of independent practitioners providing integrated longitudinal care. Dr. Jones acts as Geraldine’s case manager and is responsible for overall quality. Dr. Jones has no mandatory authority to require or prohibit specific practices by other providers or to affect their payment schedule. However, she has, via the GoldCare HSPR site, the informatics resources to review Geraldine’s care as a whole, to promote coordination among the other providers, and to advise Geraldine about the quality of her care and about her options for change.

The GoldCare HSPR site gives its provider members extensive services:

- an interactive mixture of text, numerics and graphics: standardized diagnostic workup procedures;
- statistical, AI and physiologic modeling to suggest therapy;
- decision support;
- and context dependent links for fast lookup of directly useful references in journals, textbooks and handbooks.

GoldCare has found that, while enforcement of uniform treatment guidelines had met controversy and resistance from providers, the new HSPR-based, context-dependent attempts to ensure adequate workup standards, awareness of options, up-to-date references, and appropriate treatment goals (rather than procedures) have met some enthusiasm and seem to have resulted in improved care. GoldCare tries to support, rather than stifle, the independent abilities of its member providers.

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GoldCare providers are able to interact by maintaining a cumulative sign-out sheet for their patients. It can contain any mixture of any kind of HSPR content. At each test or decision point the provider is required by GoldCare to document symptoms, differential diagnoses, orders, and care plans. This is not burdensome, since it consists of the final version of the workup that HSPR has just helped the provider do, along with pointers to entries in the provider’s electronic medical record base. Providers are careful about sign-out sheets, which form the basis of any peer QA review on that patient.

The sign-out sheet allows Dr. Jones to manage Geraldine’s case and the other providers to follow her history. In particular, they use it to jointly monitor the total profile of Geraldine’s increasing use of prescription medicines. They also use HSPR to make sure Geraldine understands what to take and when, and that she has reminders. Last year, when she was hospitalized for complications, the hospital staff used the sign-out sheet at each shift change, with quality oversight from Dr. Romano, the admitting physician, and from Dr. Jones.

The GoldCare site has thus accumulated a library of cases that underlies many of the site’s AI and statistical decision support features. This library is also the basis of GoldCare’s ability to document quality of care. The resulting reports are important in marketing GoldCare’s services to the Businessmen’s Health Taskforce, a group of employers trying to rationally control its members’ expenditures for employee health care and ensure that these dollars are buying quality.

The sign-out sheet also supports real-time chat with whiteboard and low-bandwidth video, and this is how each of the other providers meets with Dr. Jones for an annual review. During the hospitalization, Dr. Jones was able to participate when Geraldine was discussed at the Medical teaching rounds on the first morning. Six months after discharge, Dr. Romano used HSPR to follow Geraldine up with Dr. Jones. This activity also helps Dr. Romano to form a clearer picture of the long-term effects of hospital treatment options.

All of these communication features, both asynchronous and real-time, are supported by HSPR intelligent scheduling, notifications and reminders that ensure continuity and also make the activities as simple and natural for the providers as possible.

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The Breathing Club gives members access to information about the known benefits of oxygen use in COPD and also about the continuing medical debate over how rapidly in the course of the disease to phase in its regular use. Geraldine became worried about this and used HSPR to investigate, since the oxygen canister would seriously impede her activities, especially away from home, but she wanted to slow the progression of her emphysema. On her next visit, she was able to bring these HSPR displays up in Dr. Jones’s office. They reviewed the material together, with Dr. Jones explaining the significance of the issues and pointing Geraldine toward an HSPR screen that explained in layman’s terms how statistical and interpretive uncertainties can lead to conflict among scientific studies. After discussion, the two agreed that it would be sensible for Geraldine always to use oxygen while watching TV, but do without when moving about, while cooking, and in short periods of light housekeeping.

Geraldine’s respiratory inadequacy has increasingly led her to restrict physical activities, resulting in poorer muscular conditioning and increasing overweight. These in turn have led to even less exercise. The additional weakness brought on by hospitalization and bed rest increased the concerns of Dr. Jones about this downward spiral. She conferred with Dr. Lin, who agreed that Geraldine had become too dependent on external chiropractic manipulation in place of maintaining basic conditioning, and so they decided to use the community HSPR site to locate physical therapy for her. Unfortunately, all of the PTs have offices too far away to be practical for someone in Geraldine’s condition.

Since the Better Breathing Club was already aware of the difficulty of members in the Westview neighborhood in finding physical therapy, some of the members collaborated over a few months time in using HSPR to conduct an analysis of the potential viability of locating a PT office in Westview. They used GIS, influence diagrams, and a CAS simulation. Eventually, they bundled all of this together with a written narrative and sent a live electronic copy to all of the existing PT groups in the local area, also placing a notice on an HSPR national PT bulletin board.

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One group, Allen PT Associates, was initially interested. However, one of their staff pointed out that some of the Breathing Club’s modeling assumptions were unrealistic. After expanding the model at a greater level of detail, the financial outlook for the proposed Westview location seemed dubious.

Alice Weinstein, an analyst with Businessmen’s Health Taskforce had been monitoring this discussion. It occurred to her that there was unused gym space in the old Westview High that the City had turned into a Community Center. Suppose the city were to allow part-time use of this space? She redid Allen PT’s analysis with this assumption and now the numbers looked very favorable. She obtained buy-off from the City and presented the idea to Allen PT who agreed and subsequently opened the part-time center that Geraldine now goes to. Her condition has improved, allowing her to reduce her chiropractor visits and allowing her to give up the idea that maybe it was time for her to move into an adult care facility.

There were, however, other problems. The Better Breathing Club was concerned about the possibility that the air pollution from the West Expressway was responsible for unnecessarily rapid disease progression in seniors’ COPD in the Westview neighborhood. The Club had proposed to the City that one lane of the Expressway be made HOV 3. Some City Council members worried that this would hurt commuters. Subsequently, the Department of Health has hosted a debate on their HSPR site, with the Breathing Club arguing on one side of the issue, supported by some commuters hoping for a shorter commute and opposed by other commuters fearing a longer one. There seems no end to the analyses and counter-analyses that are being produced, but there has emerged a much clearer appreciation by everyone of the amazingly complex effects that this apparently simple problem has on all of them.

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