

An Integrated Systems Overview Of Health Care Behavior

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For health care, never has the classical expression “It was the best of times, it was the worst of times” appeared more appropriate. Never has health care been blessed with such a wide array of pharmaceuticals, treatment strategies and resources to improve the health care of our patients. At the same time providers are faced with an ever-growing loss of autonomy and ever-increasing financial pressures. To optimize the health care of all of our patients, we must balance the evolving opportunities with the current and future constraints.

On the financial side, the United States system of health care consumes over 14% of Gross Domestic Product (GDP).¹ Administration and bureaucracy consumes approximately 30% of those health care expenditures.² In response to the size, heterogeneous composition, and inefficiency of this industry a vast array of market forces have evolved over the past half-century. Now, in a global economy, our large health care expenditures effect our market position. This is not an editorial comment but just a statement of reality. Health care as a percent of GDP is projected to increase with the graying of the baby-boomers and rapid expansion of therapeutic options.¹ The exhilarating and challenging expansion of therapeutic options can reasonably be expected to increase expenditures for individuals for lifetime health care.

The explosive growth of health care opportunities has not been matched by a rational growth in the domain of resource allocation.^{3,4} This is true not only for delivery systems and methods but for uniform pricing and financing.⁵ The health care industry is similar to a major building project site with all the materials and subcontractors on site but no blueprint or general contractor to coordinate the project. Each group has a vision of the project. Small teams have coalesced and have done their best, but they are struggling in a reactive manner. Both a top down and bottom up approach is required to develop a blueprint for a health care system that prevents untimely death and minimizes unnecessary suffering.

Without a blueprint to navigate a bewildering and volatile constellation of industry forces, health care behavior has evolved in a reactive manner.^{6,7} Simultaneously, medical studies have advanced strategies and opportunities for both individuals and discrete populations to improve both health care and longevity.^{8,9} Unfortunately, the full clinical benefit from these significant studies has not been reaped due to inefficient and ineffective lines of communication within various organizations and constituencies that constitute the health care system in the country.^{4,10}

There has and will always be discrepancy between good advice and the application of that advice. However, the growing discrepancy between the science of medicine and its clinical application is a serious problem. Ignoring the lessons learned through landmark medical studies is generating an ever-widening ripple of consequences. This article will attempt to provide an integrated overview of health care behavior by applying a systems

engineering approach to yield a higher-level perspective. If a higher-level perspective of the overall picture is obtained, this reference framework will assist the industry and society in their endeavor to reengineer health care behavior in a more efficient manner.

The current reactive posture is understandable if we step back and review the development of health care over the last 50 years.¹¹ The vast majority of medications and contemporary therapies developed after World War II. As recently as the early 1960's the hospital was regarded as an institution of death and dying. Therapy was attempted and often very doubtful. The last two decades of the twentieth century provided vastly different therapeutic opportunities and expectations for improved health care.¹² With the current variety of therapeutic options we now must develop the blueprints to effectively utilize these gifts.

Just prior to the transition from a research domain into a clinical domain, medical science will typically utilize a controlled clinical study. Clinical studies define a distinct population to answer a specific question. The translation and application of this knowledge as it passes into the clinical domain raises a host of valid questions. Most importantly, optimal treatments for a population may be entirely different than what is optimal for an individual. Comorbidities and many other factors may alter the balance between the benefit and risk of a therapy. Fortunately, the use of consensus panels and the development of guidelines by national organizations are assisting in the contextual placement of these clinical studies.

Ultimately, the individual patient's providers must participate in their therapeutic decision. Paralleling the expansion of therapeutic options, the provider's role in partnership with their patient's has switched from paternalistic to recommender.¹³ To complicate the decision process even more, following World War II, the payment for health care services shifted from individuals to third party payers.⁴ The difficult therapeutic decisions made by patients with the assistance of their providers are now subject to review and modification by third party payers.¹⁴ A therapeutic decision is much more complicated than an economic decision. In addition to setting forth a high level systems view of the health care industry, this article will attempt to cast light on the component drivers that shape therapeutic decisions.

In the more than 50 years since World War II, researchers have built a considerable literature on systems theory and systems methodology. This literature provides both theoretical perspectives and case studies on the applications of systems methodologies. In this paper we take advantage of this literature to recommend a systems approach to understanding health care behavior.

Much of the early post war work on systems engineering focused on techniques rather than on methodology.¹⁵ In some ways the successes of systems engineering and operations research during and immediately after the war in primarily military projects impeded the development of a formal methodology.¹⁶ However, by the late 1950's and 1960's a number of systems thinkers began to clearly define the overriding methodologies rather than the techniques used to achieve successes and presumably help avoid failures.^{17,18,19,20}

At the heart of these methodologies were the steps of problem definition, alternative generation, evaluation, and decision. Not surprisingly these methodological components matched very closely with the rational decision making model discussed in economics

and political science. This overtly optimal approach was discredited as descriptive of human behavior by March and Simon in organizations and economics and by Allison in political decision making.^{21,22} Nonetheless, the basic components do describe how humans approach decision making tasks even if they do not explicitly optimize.²³

From the standpoint of health care behavior we view the problem as one of first identifying the stakeholders or decision makers. These are not individuals but groups with common goals and objectives. Each of these groups views the therapeutic alternatives through the lens of their own objectives and evaluates these alternatives accordingly. They choose an option, not necessarily optimal, based on this evaluation.

To place health care behavior in a systems context we must first identify the stakeholders and their relationships to one another. In this context, stakeholders may be groups of individuals, organizations, and or industries that share common goals. Membership in one group does not exclude simultaneous membership in another stakeholder group. For example, everyone is a member of the patient stakeholder group. Significant stakeholders must have a considerable vested interest in health care behavior, such as public or personal health, profit, product sales, or workforce maintenance.

Primary and secondary level stakeholders have been displayed in Figure 1. Groups are aggregated for simplicity. Any stakeholder group surrounding the Science Core (SC) could be divided into an ever-increasing functional array based on heterogeneity of grouping parameters. For example, providers can be divided into specialty and subspecialty segments. Although the SC is conceptually placed at the center of the health care system in Figure 1, it is imperative to remember that the patient is the customer. The patient's interaction with the SC constitutes the foundation of this industry.

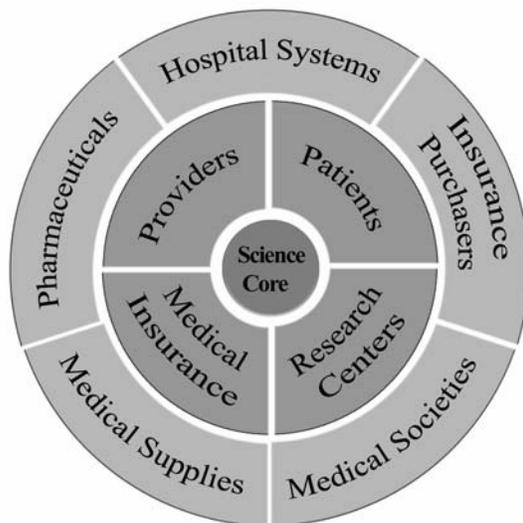


Figure 1: Core Stakeholders

The SC encapsulates all the knowledge developed by evidence-based studies and represents the science of medicine. The SC is constantly redefined and expanded over time. Knowledge in the SC changes only as a result of statistically valid studies. Stakeholder opinion will not change this knowledge but a stakeholder can and should perform experiments to constantly reshape the SC.

The four primary stakeholders surrounding the SC are Providers, Patients, Medical Insurance, and Research Centers. These stakeholders are considered primary because each has either a direct influence on the SC's development or clinical application. Note that the vantage point of all four on the SC is separate and, therefore, they may or may not interpret the SC in a similar fashion.

The outer perimeter of Figure 1 represents secondary stakeholders. For the purpose of this paper, they are partitioned into Hospital Systems, Pharmaceuticals, Medical Societies, Medical Supplies and Insurance Purchasers. These secondary stakeholders indirectly influence clinical application of the SC through the primary stakeholders. They all have major vested interests, both economic and non-economic, in the decisions of the primary stakeholders. They are all unable to directly make the decisions that provide satisfaction of their objectives, but they are in a position to have a dialog and influence primary stakeholders.

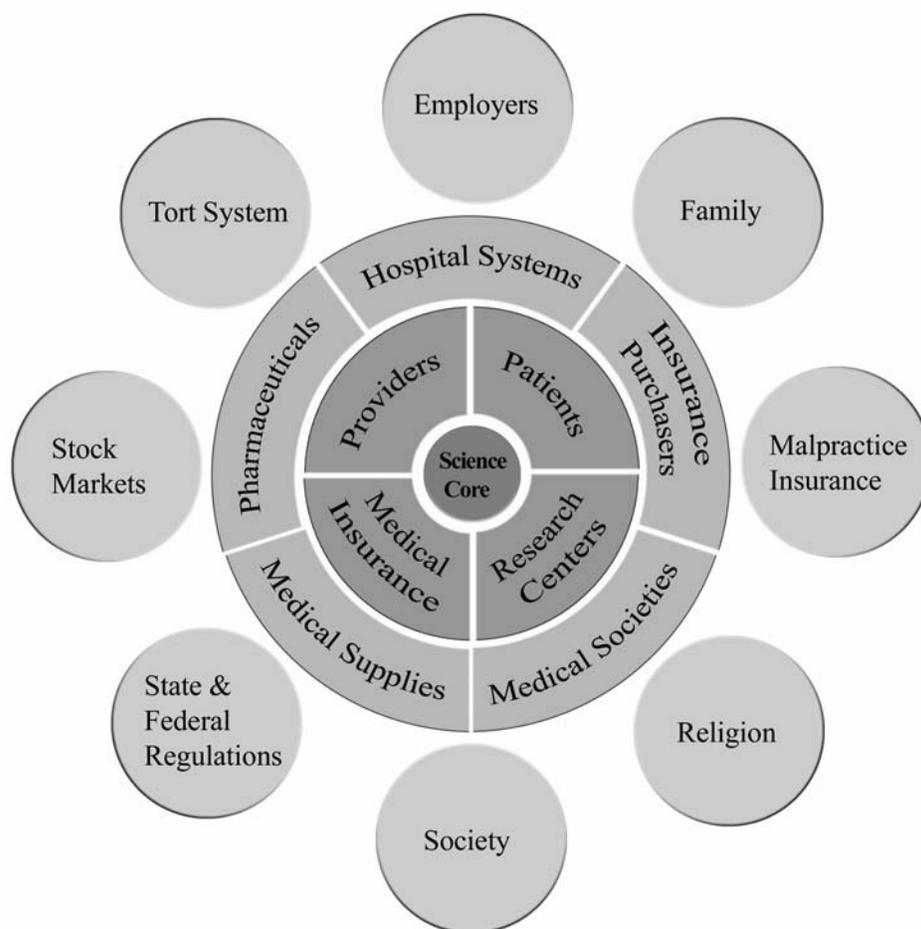


Figure 2: High Level Stakeholders

Tertiary groups and other higher order stakeholder constituencies, such as Employers, Society, Government Oversight, and Organized Religions further define the health care system around the SC. Considerable discussion could ensue about these stakeholder constituencies and their relative placement in Figure 2 as one moves away from the SC. However, it should be clear that the higher order stakeholders provide less direct impact on final therapeutic decisions. An exception is possible when Government Oversight,

Society and Organized Religions take a well-defined position. These are examples of overarching stakeholders, whose influences could permeate the entire system. A void exists when overarching stakeholders do not take a position on a discussion about SC utilization. Therefore, these overarching stakeholders will not influence the therapeutic decisions of other stakeholders. This is not to imply that a void is desired or undesired.

The third step of the systems approach, alternative evaluation, requires attributes or decision drivers that score alternatives relative to stakeholder objectives. Table 1 shows a dynamic, hierarchical array of decision drivers that are used by stakeholders to make therapeutic decisions. Stakeholder groups begin with an identical driver array but score the results of therapeutic alternatives differently which leads to different therapeutic decisions. Decisions by tertiary and higher order stakeholders propagate through lower order stakeholders.

Table 1: Driver Array Categories

Economic	Medical Legal	Conscious Non-economic
• Contractual obligation	• Licensure	• Anger
• Cost shifting / avoidance	• Public Relations	• Fear
• Long term	• Risk assessment	• Guilt
• Public Relations	• Other	• Grief
• Short term		• Love
• Other		• Omission / Commission
Unconscious Non-economic	Overarching	
• Denial	• Governmental	
• Pride / Honor	• Religious	
• Shame	• Societal Mores	

The set of therapeutic decisions made by a stakeholder group is the rational outcome of an alternative selection process using the drivers appropriate to that stakeholder group. To an outside observer, the actions of a stakeholder group may not appear rational but this is because that outsider does not understand how that group has scored the alternatives relative to the drivers in Table 1.

Ultimately, a therapeutic decision is a balance between drivers considered as health care benefits and the costs to attain those benefits. Figure 3 displays an example of a decision balance. On the fulcrum's left, the perceived and actual benefits act as weights on the balance beam. The force combination on the right side of the fulcrum consists of costs associated with the therapeutic decision. The cost drivers can be broken into five major groups (Table 1). Force combinations on both sides of the fulcrum are dynamic due to changing evaluations by the stakeholder groups with respect to the drivers. This means that a stakeholder group can change the score represented by individual drivers for therapeutic alternatives instantly or over time. We have all experienced rapid changes in a patient's therapeutic decision and this does not surprise us. For example, a driver such as anger or fear could become more pronounced as surgery approaches and result in a canceled surgery at the last minute.

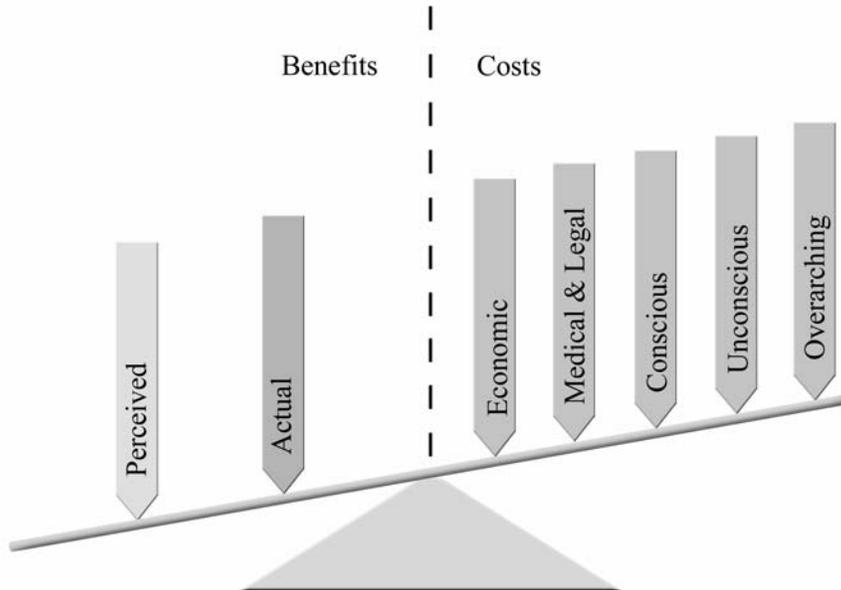


Figure 3: Stakeholder Therapeutic Decision

Another way to divide drivers is along economic and non-economic planes. The general economic drivers might be further divided along micro and macro economic considerations or by net present value (NPV). Medical-legal drivers are considered to be a separate type of economic driver. Non-economic drivers would include psychological (denial, fear, anger, etc.), social (family, mores, peer, etc.) and governmental regulation. Notice that overarching stakeholders and their overarching drivers will reside further from the fulcrum and will therefore have greater force (moment) or influence on therapeutic decisions.

If beneficial alignment between stakeholder groups can be achieved, then dramatic changes in therapeutic behaviors are possible. Most often we wish to encourage positive alignments and minimize conflicting alignments. Diagnostic related groups (DRGs) when they were introduced several decades ago had such a positive effect between Medicare and hospitals.²⁴ Eliminating cost-plus compensation for hospitals aligned short-term economic drivers and as a result the length of stay (LOS) measurements fell significantly. At the same time errors of omission were defined. The hospitals were then focused on solving the problems in the most expeditious manner possible.

Unfortunately alignment of this sort is not always possible or easy to achieve. For example, when dealing with chronic diseases stakeholder alignment on the drivers is particularly difficult to achieve. To better understand and illustrate these difficulties and how they may be overcome, consider the CHAMPS (Improved Treatment of Coronary Heart Disease by Implementation of a Cardiac Hospitalization Atherosclerosis Management Program) study design.²⁵ The CHAMPS study was performed at the UCLA Medical Center, Los Angeles, California. Poor utilization of clearly effective atherosclerotic cardiovascular disease reduction therapies is a well-documented problem. The CHAMP initiative grouped an array of efforts to collectively improve these utilization issues.

CHAMPS demonstrated that effective use of the lessons learned yielded dramatic amplification of health benefits by coordinating multiple stakeholder groups.²⁵ Better use of aspirin, cholesterol-lowering medications, beta-blockers, and angiotensin-converting enzyme inhibitor therapy coupled with counseling on smoking cessation, diet and exercise constitutes the SC's therapeutic options. Using these options are known to yield reduction of secondary atherosclerotic coronary morbidity and mortality. The stakeholders involved were patients, providers, hospital systems, home-based case managements and medical societies/consensus panels. With an algorithm based on the SC, providers' were prompted to utilize the desired therapies and treatment rates were dramatically increased.

Recurrent MI, hospitalization, cardiac and total mortality were significantly reduced in the CHAMPS study compared to stakeholder groups who had the knowledge but not the coordination of effort.²⁵ The system strength arises from aligning a group of positive drivers while minimizing the effect of non-aligned drivers. Conscious non-economic drivers aligned to yield this benefit included: love, guilt, and commission. The provider and hospital stakeholder groups focused on the system mechanics to reliably apply the lessons learned from the SC. Once all the involved stakeholder groups accepted that this course of action was the right plan, the non-aligned economic short-term and cost shifting/avoidance drivers were minimized by default. All involved stakeholders ultimately benefited from the CHAMPS study.

The pressures on the health care industry to adopt a systems approach are growing from multiple directions. While it is possible to complete a project without a coordinated set of blueprints with a variety of uncoordinated providers, the cost, end-product quality, and completion timeline can reasonably be expected to improve with the converse. Over the past several decades we have discovered the inefficiency and ever expanding bureaucracy associated with short-term reactive behavior.³

If we expand our time horizon from the current encounter/reactive frame of reference to a more holistic vantage point of either the natural history of a disease or in terms of decades, then the array of drivers for therapeutic decisions start to align themselves. There is less incentive for cost shifting/avoidance and a strong drive to deliver an expeditious and permanent problem resolution.

Individual health care decisions are made individually but these are not decisions in a vacuum since all of these decisions are interrelated. The rights of the individual must be discussed and balanced by the rights of society. Also, the inevitable conflicting goals between stakeholder groups need to be overtly recognized if we wish to eventually align or arbitrate these goals. For any one decision, a wide array of drivers has to be considered rather than the simplistic approach of picking only one driver. As previously mentioned, the dynamic nature of individual drivers further complicates the analysis.

While the SC-patient interaction pragmatically must remain the health system core, it is necessary to recognize the complex interaction between all combinations of stakeholder groups. Just as there are a series of checks and balances for all levels of government between the branches, there must be some checks and balances between stakeholder groups. Currently unbalanced medical-legal exposures, pharmaceutical charges and regulation of health insurance companies represent industry distorting sub-issues. Other major issues looming on the horizon and demanding close attention are alternative health,

e-health, technology paradigm shifts and management leadership. All of these must be viewed in a systems context.

A common set of definitions is still missing from the discussion. What defines good health care? What is a therapeutic decision? In order to move forward it is necessary to accept unified goals based on these common definitions. Currently, there are probably as many definitions of “good health care” as there are individuals in the discussion. Once definitions and goals are accepted then the requirement to define the time horizon included in the reference frame comes to the forefront.

As daunting as these tasks appear, there are mechanisms already in place to deal with these challenges. The development of evidence-based medicine has greatly assisted the medical community in their effort to apply the lessons gleaned from multiple studies as they are translated into the community.^{12,26} Consensus panels are well respected and represent an invaluable tool to place new therapies in perspective. Diverse organizations such as the LeapFrog Group, American College of Cardiology and Institute for Health Care Improvement have fostered a systems approach in the industry. Other organizations such as Institute of Medicine and Joint Commission on Accreditation of Health care Organizations (JCAHO) provide a much needed quality barometer.²⁷ All of these groups must work towards integration soon to redirect health care behavior to improve quality in a proactive manner. Only then can we begin to utilize an inclusive, proactive process, which prevents untimely death and undue suffering within our society.

We have proposed an integrated systems model to elicit discussion about current health care behavior. This is a high level, loosely configured description and not a complete definition of the health care system and its stakeholders. In the next article, we will theorize a matrix model for driver interactions that quantifies health care behavior decisions.

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