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Submitted to the Sloan School of Management  
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ABSTRACT

Innovative organizational design methods are investigated in the health care delivery field. The MIT Center for Coordination Science Inventing the Organizations of the 21st Century Process Handbook analysis is applied to the breast cancer treatment process to investigate new ways to deliver health care. Decomposition, specialization, and dependency analysis are performed to determine process structure capabilities and identify the coordinating mechanisms in place. The Process Handbook is then evaluated as a design tool and suggestions are made for its enhancement.

Three themes are presented throughout the thesis. First, the application of information technology does not only can automate and streamline organizational processes, but can provide designers with analytic tools to pinpoint process weaknesses and critical dependencies. Second, a static representation of the process (as the Process Handbook currently represents) is not enough to design the future organization. Systems Thinking and System Dynamics modeling tools must be interwoven in the design process to capture dynamic performance capabilities. Finally, the Process Handbook is as much a design process management tool as it is a process invention tool. By using it as a part of organizational design negotiation efforts, new innovations are spawned faster with more acceptance and a better chance of survival.

The medical community, in the midst of sweeping organizational change, must quickly overhaul the processes it uses to deliver service. The physician’s efforts should be focused clearly on quality health care delivery. Robust incentive systems that compensate physicians for innovative work, sophisticated medical networks that enable physicians to compete for a shrinking market, and information systems that permit faster, virtually seamless diagnosing and treatment plan must be invented and applied.

Thesis Supervisor: Professor Thomas W. Malone

Title: Patrick J. McGovern Professor of Information Systems Director of the Center for Coordination Science
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My journey into my first piece of graduate-level research would not have been nearly as rewarding without the help of many dedicated friends. My thesis advisor, Professor Thomas Malone, provided the vision that organizations do not have to be solely successful economic ventures, but also can inspire and develop the individuals within the company. His strident theory of organizational invention has helped me to see leadership in a different light. Professor J.D. Nyhart, my thesis reader, has inspired me at many times during my time at MIT. As a mentor and friend, I am deeply indebted to his academic guidance and kind words of encouragement.

My site manager, Fred Luconi, provided the key access to the medical facilities that the research team needed and his critiques challenged me to continually “dig deeper”. Professor Charles Osborn helped us take my first steps into the Process Handbook and his enthusiastic support when the going got tough spurred us on. His tireless support helped us connect the Handbook to the medical delivery process. John Quimby, of the Center for Coordination Science, answered all our programming needs and we are indebted for his inspiring analogies and ideas for process representation.

In the field, Geoff Cole of Emerson Hospital, presented us with fresh and innovative health treatment management policies that got the thesis research going. Robert Renga of Acton Medical Associates greeted our ideas with enthusiasm and his assistance gave us the kind of access and attention that made us feel like a part of the team.

As a thesis partner, Marty Geisler, was an untiring researcher, insightful analyzer, and committed contributor. As a friend, she helped me see the value in the thesis process and I will treasure the many hours spent together debating the best way to care for the sick.

The success of all my endeavors, including this thesis, are due in large part to the untiring support from my spouse, Mary Morningstar. My best friend, my confidant, and my tireless editor, she has encouraged me from my first ventures onto the MIT campus and has seen me through two of the most challenging years of my life. It is to her that this thesis is dedicated.
Chapter One. Introduction

1.1 Research Overview and Focus

Designing new organizations for the future presents a formidable task for today’s managers. More sophisticated and demanding customers, emerging global markets, and rapid technological innovations require that organizations both aggressively cut investment and operating costs and flexibly introduce new products and services to survive in a highly fluid and uncertain market. The conventional method of organizational design has emphasized altering structure to magnify an organization’s strengths and reducing its weaknesses as indicated by existing metrics. More recent attempts at improvement encourage managers to copy the “best practices” of other firms. These benchmarking practices focus on matching the excellence of other firms to improve a company’s competitive strength. Both of these efforts are limited in their effectiveness because their improvement potential is bounded by the organization’s capabilities that result from the way the organization is structured. Attempts to improve the way the organization creates value fail to input a radical change in performance potential; rather they either further reinforce or moderately modify the existing paradigms.

This thesis presents theory and analysis to help organizations “leapfrog” to the new productivity nexuses by inventing new organizations for the future. At the heart of the thesis is the formation and understanding of a way to represent processes so that organizational designers can invent their own new organizational forms. First, it is believed that a representation format that illustrates process leverage points as opposed to the functional factors can help designers choose the optimal organizational form. Second, it is hoped that linking the Process Handbook to Systems Thinking will provide a more complete tool set with which to design organizations. A final hope is that the thesis will show that the process representation format can be used for dispersed negotiation and design. By using a common framework that represents an issue, that is understandable by all stakeholders in a negotiation
(such as designing a process flow), it is believed that collaboration will be encouraged and the chances of uncovering a “win-win” solution are improved.

The environment chosen to conduct this research is the health-care delivery field. The President of the United States, in a letter to the American people in October 1993, cited six reasons for health care reform. They were: 1) rising insecurity; 2) growing complexity of medical systems; 3) rising costs; 4) decreased quality; 5) declining choices; and 6) a growing irresponsibility throughout the health care delivery industry\(^1\). In response to the Administration’s initiatives and the industry recognition of these problems, medical services are presently undergoing a fury of analysis, overhaul, and reform. This increase in activity provided an opportune venue to consider a systematic approach to understanding coordination processes. The thesis will showcase innovative medical initiatives and suggest ways to structure new health-care organizations.

### 1.2 Hypothesis

In today’s management circles, it appears clear that the activity of leading an organization has transcended the notion of merely overseeing work and attempting to optimize behavior. Managers are quickly realizing that they will have to adopt much more sophisticated skills as their companies’ needs evolve more and more rapidly and the markets and industries in which they navigate become increasingly turbulent. To accomplish this needed change, leaders of organizations of the 21st century will need to focus their vision outward. In most respects, leaders have done a good job of opening their perspective from a “today” view to looking at what was happening “yesterday” and what will happen “tomorrow”. Organizational complexity and a quickening market dynamic now require a manager who can contemplate the future form of the organization by casting his/her gaze on “the day after tomorrow”. To do that, he/she will need tools that can uncover the nature of the design elements in Table 1.1.

<table>
<thead>
<tr>
<th>Elements for Design</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who are the <em>actors</em></td>
<td>The actors or stakeholders in the process who will be undertaking the organizational transformation.</td>
</tr>
<tr>
<td>What are the <em>goals</em></td>
<td>The present goals that are not being met or the future goals around which the design effort will be oriented.</td>
</tr>
<tr>
<td>What are the <em>current capabilities</em></td>
<td>The core competencies and capabilities of the organization to make the transformation.</td>
</tr>
<tr>
<td>What are the <em>desired capabilities</em></td>
<td>The core competencies and capabilities needed for the future state of the organization.</td>
</tr>
</tbody>
</table>

Table 1.1 Organizational Transformation Elements

These elements are not trivial and their descriptions are far from static in nature. Instead, they represent dynamic components of the designer’s solution and must be considered in turn. This complexity means that no one tool can provide each and every solution that the manager and the organizational designer seek. The complexity does not imply, however, that the designer should abandon these tools because they do not provide a complete solution. On the contrary, the manager should use these tools in concert, applying the maximum pressure to the organizational change objectives he/she desires. The tools suggested and their contribution to the design solution are as follows:

- System Dynamics Modeling and Systems Thinking - a way of thinking that considers the systemic causal relationships among activities. A dynamic organizational/process modeling tool that considers the interrelationship among system variables and their inherent feedback.
- Organizational Learning - an ongoing quest to craft the organization with the ability to create its own future through adaptive and generative learning\(^2\).

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• Integrative Bargaining and Conflict Resolution method to approach a joint agreement from opposing group members that results in a “win-win” solution to negotiation.

It is through the use of these tools that the designer gains a complete understanding of the potential of the organization he/she wishes to design.

1.3 Project Goals

The goals of this project are three-fold. First, the project will describe and record the health care delivery process for breast-cancer treatment. This description will be outlined and entered into the Process Handbook as part of the Massachusetts Institute of Technology (MIT) Center for Coordination Science (CCS) Inventing the Organizations of the 21st Century initiative. These process entries will be formatted to enable universal understanding and allow managers to view structural merits of the process alternatives.

Second, the Process Handbook description will be analyzed considering the dependent factors that affect organizational performance. The role of information technology that exists in the present structure will be examined and analyzed for opportunities for improvement. The role of physician incentives will be considered, looking for ways to keep the health care delivery process innovative while at the same time helping physicians keep costs down and quality high. Key aspects of the negotiation process will be examined and opportunities will be investigated for using the Process Handbook as a negotiation tool for stakeholders in organizational design.

Third, insights should be born from this process. Innovative process management measures will be showcased and analyzed for their coordination effectiveness. Recommendations will be made for improving the existing paradigm of health care delivery with a focus toward tangible methods that emanate from the Process Handbook analysis.
1.4 Combining Coordination Theory with Systems Thinking and Negotiation: A Method to Invent/Design Organizations

The MIT Center for Coordination Science Inventing Organizations of the 21st Century initiative has at its roots several distinct goals for the organizational design process. The six major components of the initiative are:\footnote{MIT Sloan School of Management, Inventing the Organizations of the 21st Century: A Partnership in Research and Education (Cambridge: MIT Press, 1995) 9-11.}

- Study today’s innovative organizations
- Experiment with new technologies
- Develop new theories on the nature of work
- Create scenarios of future possibilities
- Encourage testing and implementation of new concepts
- Develop educational programs

The Process Handbook may be able to satisfy each of these goals. However, other disciplines, such as Systems Thinking and System Dynamics, can be used to enhance understanding of the design process. For instance, systems dynamics models could be used to model the last three components. Scenarios could be developed that modeled both the present and future process states. These could then be simulated and tested to verify the new concepts. Finally, by allowing students to experiment with different process structure and simulate performance, the Process Handbook/System Dynamics model combination could be used as an educational tool.

1.5 Thesis Outline

Chapter One introduces the research overview and focus of the thesis. The hypothesis is presented and the project goals are outlined. The idea of combining coordination theory with systems thinking and negotiation as a method to invent/design organizations is introduced and the thesis outline is provided.
Chapter Two provides the background and theory for the Process Handbook. Coordination theory-new organizational designs. Biographical information is included for the Center for Coordination Science and the research sites. The Process Handbook is discussed in detail and the theories of systems thinking and integrative bargaining are introduced.

Chapter Three covers the general research methodology and the process handbook methodology.

Chapter Four provides a clinical description of the breast cancer malady including description/incidence/statistics, diagnosis, treatment options, and follow-up & rehabilitation.

Chapter Five presents the breast cancer treatment process map description. An overview of the process is first considered and then initial detection, payment collection, case management, early detection activities, medical intervention activities, and rehabilitation and follow-up activities are considered in turn.

Chapter Six is the Process Handbook analysis. First the generic processes are analyzed. Then, the decomposition, inheritance and specialization elements are examined. Dependency analysis is performed and further process handbook efforts.

Chapter Seven considers the role of incentives. First, the nature and the role of incentives are considered. Fee for service and the HMO models are contrasted and ways to better manage incentives are suggested.

Chapter Eight presents theory on the role of the Process Handbook during organizational negotiations. The elements of negotiation are presented first and negotiating through the process handbook is considered. As an example, the ARPA/MIT Medical Room of the Future is examined.
Chapter Nine introduces the notion of combining the Process Handbook analysis with Systems Thinking and System Dynamics. Systems thinking elements are presented along with systemic considerations and learning possibilities for the Process Handbook.

Chapter Ten uncovers the implications of the research. Comparisons are made with other organizational forms and ways to invent new organizational forms are considered.

Chapter Eleven contains recommendations, conclusions, and future research thoughts.
Chapter Two. Background & Theory

2.1 Coordination Theory - New Organizational Designs

Good leaders and managers can be thought of as individuals who are constantly seeking ways to increase the performance of their organizations. These people perceive the organization’s ability to compete in the marketplace and then actively search for leverage points within the company that they can influence to improve outcomes. Once these leverage points are discovered, managers then try to determine in which direction the leverage points must be articulated and then mobilize resources to move those levers. In effect, they are trying to optimize the group’s outcomes by making a myriad of leverage choices, analyzing costs and benefits, and then maximizing their positive effects.

This approach is desirable when one wants to improve organizational performance within the boundaries of the prevailing paradigm. Increasingly, managers are finding that they have exhausted their efforts to improve their organization’s performance by improvement measures alone. In essence, they have squeezed virtually all of the organization’s potential for growth and improvement. This occurs because an organization’s potential is based on the organization’s design and structure. Organizations, made up of capital resources and people, are structured in a particular way to perform a complement of tasks. This structure, although allowing the organization to perform many feats well, also constrains it to a limited set of performance outcomes. Improving labor and resources can only improve resources so far. Beyond that point, a radical redesign of the organization’s structure is needed. According to Michael Hammer in his now famous book, Reengineering the Corporation⁴,

To reinvent their companies, American managers must throw out their old notions about how businesses should be organized and run. They must abandon the organizational and operational principles and procedures they are now using and create entirely new ones.

The Process Handbook is a tool for reinventing organizations. Instead of focusing on the actors and the resources available to the organization, it focuses on understanding the processes that underlie what the organization is trying to accomplish. Once the processes are understood, designers can then change the way the organization manages the processes that fulfill its strategic mission.

Coordination theory comes is introduced in the process at that point. Coordination can be viewed as actors performing independent activities that achieve goals\(^5\). A successful organizational designer will invent an organizational form that will enable actors to perform their independent activities in a manner that will improve their opportunities to achieve their goals.

### 2.1.1 What is Coordination Theory?

Coordination theory derives its roots of study from the notion that activities are organized through mechanisms that coordinate them. These mechanisms are often invisible when activities are working well together, but become apparent as process performance declines. This suggests that there are two types of mechanisms in a process: the core elements of the activity itself and the actions that coordinate the core elements. To begin understanding coordination theory, it helps to understand how coordination is defined. According to Malone and Crowston\(^6\):

> Coordination is the act of working together.

Coordination theory draws on a variety of research fields including economics, computer science, organizational theory, information systems, management science, and psychology.

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\(^5\) Thomas W. Malone and Kevin Crowston, Toward an Interdisciplinary Theory of Coordination, MIT Center for Coordination Science CCS TR# 120, April 1991, v.

\(^6\) Thomas W. Malone and Kevin Crowston, Toward an Interdisciplinary Theory of Coordination, MIT Center for Coordination Science CCS TR# 120, April 1991, 3.
Coordination theory is presently defined as a body of principles delineating how activities can be coordinated, i.e., how actors can work together\(^7\). The theory first attempts to identify the coordinating actions that enable or prevent actors from working together in a “desirable way”. It is believed that by altering the coordination structure, we can change how independent activities are coordinated which will, in turn, change performance outcomes.

There are two methods available from coordination theory that apply directly to the development and use of the Process Handbook: parametric analysis and baseline analysis\(^8\). Parametric analysis allows us to compare two systems for parametric similarities and differences. For example, the value qualities that apply to two objects, like money and gold, may be similar even though other properties like color, weight, and malleability may be different. Baseline analysis allows us to consider the behavior of a system by using a reference theory and then explaining deviations from the behavior by other theories. This method helps designers go from a process that works well initially to a new level of performance. Both these methods will be used to analyze alternatives to the present health care delivery process.

### 2.1.2 Components of Coordination

The study of coordination focuses the attention of the manager on the nature of processes. Processes can be analyzed by considering four elements that appear to be common to all. The first element is the goal of the process. The process goal can be analyzed at several levels within the organization depending on which actors are viewing the activities. A manager can consider the overall goal of the process or the goals of each of the individual activities within the process. The associated coordination processes, then, are to identify the goals. The second element is the process activities themselves. The granularity of the activity description is important because the attributes that make the process interesting are defined by the specific activities. In general, the activity description at the lowest level should specify a single task.

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\(^7\) Thomas W. Malone and Kevin Crowston, Toward an Interdisciplinary Theory of Coordination, MIT Center for Coordination Science CCS TR# 120, April 1991, 3.

\(^8\) Thomas W. Malone and Kevin Crowston, Toward an Interdisciplinary Theory of Coordination, MIT Center for Coordination Science CCS TR# 120, April 1991, 5.
along with a discrete goal. The associated coordination process is mapping the goals to the activities (goal decomposition). The third coordination component is the actors involved in the activities. These are not the specific people, but the positions of skill that are responsible for some portion of the activity. The actor writing this thesis, for example, should not be described as Wilder Leavitt, but as an MIT graduate student. The coordination process is mapping the activity to the actor. Finally, and perhaps most interestingly, are the process interdependencies. For a complete understanding of the dynamic forces at work within a process, we need to understand the interdependencies between activities and among groups of activities. The process coordination, in this case, is managing the interdependencies.\(^9\)

2.1.3 Basic Coordination Processes

To understand fully how coordination works, it is helpful to understand the basic processes of coordination as described by Malone and Crowston\(^10\). These elements of the coordination process are:

1) Top-down goal decomposition. This is one of the most common methods of coordination and follows a hierarchical structure of goal identification and decomposition. The process starts when a goal is identified. Then, this goal is used as a top level anchor from which the specific tasks and activities are decomposed from the original goal. This method is typically employed by managers who are designing an organization around the achievement of a specific task. The choice of how to arrange processes (e.g., by product, by function) is often made without considering the nature of the coordination mechanisms needed to manage the organizational structure.

\(^9\) Thomas W. Malone and Kevin Crowston, Toward an Interdisciplinary Theory of Coordination. MIT Center for Coordination Science CCS TR# 120, April 1991, 10.

\(^10\) Thomas W. Malone and Kevin Crowston, Toward an Interdisciplinary Theory of Coordination. MIT Center for Coordination Science CCS TR# 120, April 1991, 13.
2) Bottom-up goal identification. This can be viewed as emerging from an outside manager who witnesses the activities between two processes could be combined to achieve a new goal. This new goal then provides a new anchor for process generation.

3) Resource allocation (managing resource interdependencies). Probably one of the most frequently used coordination processes, resource allocation mechanisms act to manage the use and distribution of scarce resources. The coordinating activities that apportion resources can be managed by many methods including economic prioritization and task assignment methods.

4) Sequencing and synchronizing (managing timing dependencies). This is a common problem in many systems and involves the timing of multiple activities. Sequencing refers to the precise timing of activities in order to minimize conflict. Synchronization attempts to ensure that resources are positioned to ensure activities happen simultaneously.

2.2 Center for Coordination Science

The Massachusetts Institute of Technology Center for Coordination Science supports research that explores coordination theory and the way work is performed by people and corporations, and how information systems can coordinate work and make it more effective. The center attempts to redefine organization structures and behaviors with the proliferation of information technology and the world-wide acceptance of new organizational forms of doing business.

The Center’s research is organized into three main areas. First, organizational structures are examined studying how people work together and how this interaction may change when information systems are introduced into the workplace. Second, coordination technology studies design and explore the innovative computer systems that enable people to work better in small or large groups. Finally, coordination theory research develops and tests theories on
how coordination occurs and how it can be managed in a variety of human, market, and computer systems.

2.3 Site Overviews

2.3.1 Emerson Hospital Overview

Emerson Hospital is a nonprofit, acute care community hospital with over 200 beds located in Concord, Massachusetts. The Hospital is the dominant health facility serving the communities of Acton, Bedford, Concord, Lexington, and Maynard. The Hospital provides a broad array of both inpatient and outpatient services to the community. Its services include pediatrics, obstetrics/gynecology, psychiatric care, diagnostic procedures, outpatient surgery, cardiac medicine, cancer care, and emergency/trauma treatment. The Hospital also provides home health care and numerous health care education programs and support groups. Additionally, the Hospital provides training for practitioners in cooperation with seventeen colleges and schools.\(^\text{11}\).

2.3.2 Acton Medical Associates Overview

Acton Medical Associates, P.C. is a group practice of internists and pediatricians who have united to provide high-quality primary care for patients of all ages. Acton Medical Associates provides 24-hour medical coverage with the advantage of a personal physician. Acton Medical Associates sees both HMO and non-HMO patients and contracts with specialists and Emerson Hospital to provide a continuum of care for its patients.\(^\text{12}\).

2.3.3 Concord Hillside Medical Associates Overview

\(^\text{11}\) Official Statement, 1 December 1989, Massachusetts Health and Education Facilities Authority.

\(^\text{12}\) Acton Medical Associates, P.C. Internists Information Brochure, revised 6-94.
Concord Hillside Medical Associates is a group practice of internists, pediatricians, cardiologists, radiologists, optometrists, and mental health specialists who have united to provide high-quality primary care for patients of all ages. Concord Hillside Medical Associates provides 24-hour medical coverage with the advantage of a personal physician. Concord Hillside Medical Associates sees both HMO and non-HMO patients and contracts with specialists and Emerson Hospital to provide a continuum of care for its patients.

### 2.4 Process Handbook

#### 2.4.1 Description

The Process Handbook initiative attempts to provide a language for organizational designers to communicate and choose new, innovative organizational forms. It is intended to provide an on-line representation of organizational processes illuminating the relative advantages of alternative process structures. It is hoped that this handbook can be used to redesign existing organizational processes, invent new processes where information technology application can be advantageous, and generate software to support process management\(^\text{13}\).

A process handbook, in effect, allows managers and designers to speak a common process language. Consider the representation of music\(^\text{14}\). At one time, musical notes were represented by finger positions placed on an instrument. The musical notation on paper for a guitar, for example, would show a picture of the instrument and where the fingers should be placed to achieve the desired musical expression. This notation, however, lacked the ability to be transmitted across instrument mediums. A violinist, and more extremely, a pianist would need music specifically written for their instruments. With the advent of the g-clef notation system, music for all instruments could be represented with the same notation scheme making it accessible and usable by all.

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\(^{14}\) From a discussion with John Quimby, MIT Center for Coordination Science.
That is the goal of the Process Handbook: to represent and understand the structure, the benefits, and the detriments of different processes. An adequate representation medium would allow the designer to represent processes, view alternatives, and evaluate the merits of each. He/she would also have the ability to tailor processes to represent his/her needs.

2.4.2 Decomposition, Inheritance and Specialization

Mapping the process begins with the process goal. In this case, the goal is to provide medical service to patients. Point of view is crucial here because it determines the rest of the process evolution. For instance, we could say that the goal is to “make profits for shareholders” or “provide specific surgeries”. Whatever the point of view taken, it should appropriately describe the core goal for the process that one wants to design. In this case, medical care could be provided with or without realizing a profit without the process being radically different. Using “making a profit” as a goal could be realized by many different activities. Therefore, *Provide Medical Care* becomes the goal of the process.

The next step is to decompose the goal into sub-activities called decompositions. This decomposing breaks the goal into subordinate activities that describe the specific actions that must be performed in order to form a process that achieves the goal. Figure 2.1 shows how selling a product can be decomposed into five elements of a process.
This process decomposition represents the general process of selling a product. The process is also shown specialized into two alternative methods of selling a product: direct mail sales and retail storefront sales. These two methods of selling are specializations of the parent process, *Sell Product*. When the specializations are formed, they inherit the decomposition structure of the parent process as shown by the shadowed boxes.

The ideas of inheritance and specialization are not new to those experienced in the information technology specialty. Object-oriented programming and knowledge representation are used in hierarchical programming structures and employ general categories at higher levels that lead to more specialized categories deeper into the program’s lower levels\(^\text{15}\). As one works down the hierarchical tree, objects inherit characteristics of the “parent” object. The sub-level object can accept the characteristics or modify them by the addition of new ones or the deletion of existing ones. This tracing exercise, by itself, helps to uncover process commonalities and differences between alternatives.

2.4.3 Managing Dependencies

A useful approach for organizational designers is to determine the advantages and disadvantages of the way in which a process is coordinated by considering the dependencies that exist between activities. If we consider all processes as a set of activities that are arranged to achieve a desired outcome, then we can observe and analyze what aspects or qualities on which each of the activities depend in order to be accomplished. This process of focusing attention on the activities of a process attempts to identify what is needed to support their existence and completion. When we can identify these “dependencies”, we can then better understand how the activities relate to each other and how best to manage them. This implies that coordinating processes can be considered ways to manage dependencies between activities.\(^{16}\)

Table 2.1 provides an illustration of some most clearly understood dependencies with the coordination processes that can be used to manage them.

<table>
<thead>
<tr>
<th>Dependency</th>
<th>Examples of Coordination Processes for Managing Dependency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Resources</td>
<td>“first come/first serve”, priority order, budgets, managerial decision, market-like bidding</td>
</tr>
<tr>
<td>Task Assignments</td>
<td>(same as for “Shared Resources”)</td>
</tr>
<tr>
<td>Producer/Consumer Relationships</td>
<td>notification, sequencing, tracking</td>
</tr>
<tr>
<td>Prerequisite Constraints</td>
<td>inventory management, (e.g. “just in time”, “economic order quantity”)</td>
</tr>
<tr>
<td>Inventory</td>
<td></td>
</tr>
<tr>
<td>Usability</td>
<td>standardization, ask users, participatory design</td>
</tr>
<tr>
<td>Design for Manufacturability</td>
<td>concurrent engineering</td>
</tr>
<tr>
<td>Simultaneous Constraints</td>
<td>scheduling, synchronization</td>
</tr>
<tr>
<td>Task/Sub-task</td>
<td>goal selection, task decomposition</td>
</tr>
</tbody>
</table>

Table 2.1 Examples of common dependencies between activities and alternative coordination processes for managing them.\(^{17}\)


For example, two people working in a hospital want to use the same x-ray machine. The x-ray machine is a shared resource, the activity "Take x-ray" partly depends on the availability of the machine. Management can impose a coordination mechanism to manage this dependency. The supervisor in charge of making the management decision might weigh the advantages of a "first come/first serve" vs. a managerial decision mechanism to manage the scarce resource. He/she might also impose a "free-market" mechanism that forces workers to exchange credits for use of the machine. Those wishing to use the machine the most will give up the most credits and the resource will be economically shared (although arguably not in the most desirable way).

A final important distinction when doing dependency analysis is to understand the difference between mandatory and latent dependencies. Mandatory dependencies are those dependencies that must be managed for a process to work at all. In the example above, the x-ray machine is a scare resource and a shared resource dependency exists that must be managed if the process of providing x-rays to all patients is to occur. Latent or optional dependencies are those that are not required for the process to work, but when managed, the process can work much better. It will be shown later that the organizational designer should be identifying both of these types of dependencies while he/she is crafting the organization.

2.4.4 Process Representation

An organizational designer could use the Process Handbook in the following manner:\textsuperscript{18}

1) The organizational designer enters the Process Handbook by specifying a general situation from a set of alternatives in which he/she is interested. For instance, he/she may want to view how different organizations perform a surgical procedure. Entering at this generic level provides an anchor point for the rest of the Process Handbook navigation effort.

2) Once involved in the general selection of the handbook, the designer can then specify attributes and features that are important to the organization. One might desire that surgical procedures have a minimal failure rate while minimizing cost and redundancy.

3) The Process Handbook will then present existing or suggest new organizational forms by which to coordinate the subject activities. It will also present a trade-off matrix that espouses the values of the coordination process, allowing the designer to consider whether the organizational form is adequate.

4) The designer should then be able to view alternative organizational forms by seeing a flow diagram for each process, examining the basis for the evaluation of each goal, seeing benefits for success from using a process, and observing how other companies accomplish the goal using different forms.

2.5 Systems Thinking and Integrative Bargaining

2.5.1 Basic Premise of Systems Thinking

Consistent with the notion of a descriptive, proscriptive handbook for process analysis is the theory of Systems Thinking and the discipline of System Dynamics. These theories consider the dynamic behavior of activities through model simulation. By combining the Process Handbook with the attributes of System Dynamics, it is hoped that a more complete understanding of organizational dynamics and process representation may be reached. The Process Handbook provides a more static look at the organizational structure while Systems Thinking and System Dynamics complement the Handbook with a dynamic performance analysis of the organizational form.

2.5.2 Basic Premise of Integrative Bargaining
The design process of an organization cannot focus solely on the content of the organizational structure, but must consider the process used to achieve the final design. Optimally, the organization’s leader will be accompanied by fellow designers and the team will use the Process Handbook to better understand their processes. As a tool, the Process Handbook alternatively can be used to facilitate collaborative negotiations during the design process. The Process Handbook supports many of the requirements for integrative solutions to design conflicts. Through its use, conflicting factions within the design team can coalesce around a design that best suits the stakeholder’s interests.

2.5.3 How to Approach Organizational Design with the Process Handbook

No matter what the level of analysis, organizational designers have a great deal to think about. A scenario for using the Process Handbook, Systems Thinking/System Dynamics, and Collaborative Negotiation measures might look like this:

- Someone needs to accomplish a goal, in this case, to provide medical service.
- They look at the Process Handbook to view and analyze their existing organizational model.
- They review the existing model’s dynamic performance and behavior by considering the representative system dynamics model.
- They then examine the process, looking for the core processes, the generic structures, and associated dependencies.
- They examine the structural behavior of the dynamic model.
- They adjust structural “values” to modify the systemic behavior
- If major invention is required, they choose attributes that they have determined are necessary for their new organizational form to succeed.
- They consider the dependencies, resulting coordination mechanisms & behaviors that are important.
- They select appropriate organizational design.
• This process is iterated using the elements of integrated negotiation to encourage learning and an optimal process design.

One possible way to represent the combinatorial nature of organizational design is shown in Figure 2.2.

Figure 2.2 Organizational invention tools.
Chapter Three. Methodology

3.1 General Methodology

Approaching the thesis process, a methodology was used to flesh out the health-care delivery process, showcase innovative management techniques, and uncover substantive theoretical implications of combining coordination theory with systems thinking and collaborative negotiations in the design process. To accomplish this, the methodology employed followed a path of hypothesis, discovery, analysis and theory proposal.

First, a field of study was chosen to observe a process. The medical field was chosen based on the interests of the two graduate students conducting the research and one of the site managers. Once this was accomplished, the appropriate sites were chosen considering accessibility, availability of qualified human subjects, and the opportunity to observe a process that had potential contributions to the Process Handbook.

Second, a malady was chosen by which to conduct the study. Breast cancer was selected because it was of interest to the thesis students and managers of the subject sites and represented a significant malady whose treatment could benefit from insights. It was also chosen because its treatment cut across multiple boundaries of organizational control. By observing how the cancer treatment was coordinated within and across organizational boundaries, the researchers hoped to better understand how the Process Handbook could be used.

Research was then performed to understand the treatment characteristics of the malady and the medical delivery environment in which patients are treated. With the sites chosen, interviews were conducted on site at Acton Medical Associates, Concord Hillside Medical Associates, and Emerson Hospital. These interviews and other data collected from the actors at these facilities provides the bulk of the data from which the thesis conclusions are based.
3.2 Process Handbook Methodology

The primary objective of the interviewing and data collection methodology was to populate the Process Handbook with useful information about a specific process: breast cancer treatment. In order to do this, the Process Handbook imposes a number of requirements on data before input: common vocabulary, expandability, appropriate level of abstraction and granularity\(^\text{19}\). A significant portion of research time was spent determining terminology and choosing the appropriate level of focus for the process. The convention of describing activities with a verb first followed by objects was applied consistently. As the process is represented, there are opportunities to further develop sub-processes. It was also mapped with consideration for previous research conducted at Marlborough Hospital for the process “Be a Hospital”. It is believed that the process can interleave with the existing Marlborough process in the future.

3.2.1 Process Definition

The first, and maybe the most vital part of the process mapping venture, is to carefully and specifically identify the process that you desire to map. For the purpose of this thesis, we wished to map the delivery of health care. This could be mapped from many different perspectives and levels of granularity. For example, a process map of being a hospital would differ from that of delivering breast cancer treatment which in turn would differ from performing a breast biopsy in both scope and detail. The process should be defined with the organizational designer’s point of view in mind and the level of analysis should permit the designer to use the Process Handbook to change organizational elements that are important to the designer.

3.2.2 Data Gathering

Data gathering was approached from several aspects. First, a full document research sweep was performed of the breast cancer malady and treatment processes to understand what clinically should occur when providing this type of health care. Current published literature on United States Health Care Reform Policy, health care management, coordination theory, systems thinking and system dynamics, and negotiation was also researched. Internet resources were explored for governmental health care policies and innovative measures. Resources were contributed from the National Institutes of Health, the American Cancer Society, and the Harvard Community Health Plan.

Once this preliminary research was completed, an extensive interview process ensued to understand the delivery of health care for breast cancer patients who get their service from Acton Medical Associates, Concord Hillside, and Emerson Hospital (see Appendix C).

3.2.3 Process Map and Analysis

At the heart of the Process Handbook analysis is the process map documentation and resolution. Three elements of the process map provide a methodical description tool that enables those working with the Handbook not only to accurately represent activities, but gain insights. These elements are decomposition, specialization, and dependencies.²⁰

The decomposition domain represents the vertical nature of activities. Put simply, generic processes are decomposed into their more specific, detailed components. These components share two qualities: sub-processes and steps. Sub-process activities can be thought of by looking for those activities that are part of other activities. For example, “placing an order” is a natural decomposition of “selling a product” since it can be described that placing an order is part of selling a product. Similarly, decompositions also show the relationship “steps in” a

process. Therefore, "placing an order" and "filling an order" are steps in "selling a product" and can be considered part of the decomposition.

If decompositions represent the part of and steps in an activity representation, then the specialization of activities shows the ways to accomplish a process. For instance, the decomposed step of performing a surgical procedure could be specialized into two alternate procedures for a partial or a full mastectomy. Although they are two distinct processes, they represent alternatives of the parent surgical process. There, essential procedural activities are the same with slight modification.

The last essential element for performing the mapping method is to show the dependencies between and among activities. These were displayed as arrowhead lines for all flow dependencies. For the remaining dependency descriptions, spreadsheet tables were used to catalogue each activity, dependency type, and the coordination mechanism used to manage the activity's dependency.

3.2.4 Insight Generation

The most relevant part of the Process Handbook analysis is insight generation. By methodically outlining the process activities and performing the specialization/dependency analysis, insights about alternative organizational forms should emerge. A useful outline of the Process Handbook population and analysis methodology is presented in Table 3.1
<table>
<thead>
<tr>
<th>Stage</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity Representation</td>
<td>• activities, attributes, relationships</td>
</tr>
<tr>
<td></td>
<td>• candidate activity hierarchy defined including decomposition and specialization</td>
</tr>
<tr>
<td>Dependency Analysis</td>
<td>• candidate dependencies identified and defined</td>
</tr>
<tr>
<td></td>
<td>• coordination methods identified</td>
</tr>
<tr>
<td>Verification</td>
<td>• activity hierarchy and dependencies verified; iterative revision and verification</td>
</tr>
<tr>
<td>Context Description</td>
<td>• industry and company information</td>
</tr>
<tr>
<td></td>
<td>• line of business and product descriptions</td>
</tr>
</tbody>
</table>

Table 3.1 The four parts of a Process Handbook entry

This process will uncover the core activities and associated dependencies. It will also uncover the management mechanisms at work to coordinate activity. Finally, it will stimulate new ideas about how to organize activities.

---

This chapter is provided to give a clinical background to the breast cancer malady and provides the basis for the process description. Most of the information is taken directly from the American Cancer Society's on-line information resident on the Internet.

4.1 Description/Incidence/Statistics

Breast cancer, a cancer that is common in women, is a disease in which cancerous (malignant) cells develop in the tissues of the breast. Breast cancer is still the most common form of cancer among American women, accounting for more than 30% of all cancers in women. One in nine American women will develop breast cancer, about 180,000 this year alone. This year, about 46,000 American women will die because of breast cancer. Only lung cancer causes more cancer deaths among women. The number of deaths due to breast cancer could be much lower if more women had mammograms as recommended beginning at age 40, had a yearly breast exam by a physician, and practiced monthly breast self-examination. By following these simple steps, women can help ensure that developing breast cancers are caught in their earliest, most curable stages.

Risk factors for breast cancer include being older than 50, having a personal or family history of breast cancer, never giving birth, and first giving birth after age 30. There is mounting evidence that a high-fat diet can increase the risk of breast cancer. An injury to the breast may call a woman's attention to a tumor that is already there, but cannot cause breast cancer.

Breast cancer is mainly thought of as a woman's disease, but men can also develop breast cancer. About 300 men die of the disease each year.
4.2 Diagnosis

The diagnosis of breast cancer begins with a complete medical history. This involves a series of questions aimed at finding out about a woman's personal and family history of breast cancer, other medical problems, and overall health. The doctor will examine both breasts for lumps or thickenings, changes in shape or the way the breasts feel, nipple changes, and enlarged lymph nodes in the neck or under the armpit.

Mammograms will be taken of both breasts. Even if a finding on a previous mammogram was the reason the woman came to the doctor, it is likely that a mammogram will be done again to try to confirm the first finding and to check for disease that may be present in both breasts. Ultrasound, which uses high-frequency sound waves to produce images, may also be done, although its primary purpose is for discovering cysts rather than cancer.

There are several testing methods that can be used to assess the nature of the lump. These include:

1) Percutaneous Needle Aspiration. A long, thin needle is inserted into the lump to draw out a small tissue and/or fluid sample. The fluid and/or tissue is then tested by pathology for malignancy. If the tissue is malignant, this confirms that the breast is cancerous. If the test is benign, it does not rule out cancer and open biopsy should be performed. This procedure can be performed by the radiologist or the surgeon. The test is easy to do in a doctor's office, hospital outpatient department, or clinic. It is also very accurate, but there is always the chance that the needle may not be placed properly, miss the tumor, and take instead a sample of normal breast tissue. Also, this test is not recommended for women with large breasts and a small lump near the chest wall, or for women with a lump that does not show up on a mammogram.

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2) Biopsy. This is the removal, by surgery, of a sample of body tissue for examination under the microscope. Here a mass of cells is removed and sent to the pathologist to confirm the patient’s condition. There are two methods to perform this: frozen section and paraffin block. This can be performed by the radiologist or surgeon.

If the needle biopsy is not used or if it indicates cancer is not present, but there is still reason to suspect cancer, part of the lump, or the whole thing, will be removed by surgery. If this test shows the lump is indeed cancerous, the diagnosis is made and treatment can follow.

Today, most women prefer to have the biopsy performed separately from any treatment that may be needed. In this case, the biopsy is usually done as an outpatient procedure under local anesthesia, so that the woman remains conscious. If the results of the biopsy show that cancer is present, the woman can then discuss all treatment options with her physician, cancer specialists, and friends and family members.

Because the biopsy and primary treatment are two separate procedures, this is called the "two-step" method. Some women, however, may prefer the "one-step" approach. The biopsy is done under general anesthesia, so the woman is not conscious, and the tissue sample is instantly frozen and rushed to the hospital laboratory where it is examined under a microscope to see if cancer cells are, indeed, present. If the sample does contain cancer cells, the surgeon immediately proceeds with the treatment the woman approved ahead of time.

3) Estrogen and Progesterone Testing. These tests will be conducted to determine if the cancerous cells are receptive to estrogen and progesterone (hormone) treatment.

4) Further Testing. Breast cancer may transmit to other organs. Other methods for testing the extent of the cancer spread include: blood tests, x-rays, CT scans, and bone scans.
4.3 Treatment Options

Several different methods may be used to treat breast cancer, but the main treatment is usually surgery to remove the cancerous area and to take a sample of the lymph nodes in the armpit to see if the cancer has spread. Surgery might not be done if the cancer has spread so widely that removal of the tumor or breast would not improve the chance of survival, or if the patient is too weak to have surgery. Generally, the choice of a particular type of treatment depends on the type of breast cancer, the stage or extent of the disease, a woman's age, her overall health condition, and her willingness to accept certain side effects of treatment and perhaps participate in experimental programs known as clinical trials. A woman interested in breast reconstruction (creating a new breast-shaped structure) should discuss this with her doctor before treatment is begun. Plans for reconstruction could change the kind of surgery performed to remove the breast.

In deciding what kind of treatment to have, a woman may choose to talk it over with her sexual partner, close family members, and friends. She may also discuss it with her primary care physician who is aware of her general health status and will probably manage the long-term follow-up care, and with the specialists at the hospital where the cancer will be treated.

Because different types of breast cancer grow at different rates, it is important to find out what kind of cell is involved. Seventy percent to 80% of all cases of breast cancer involve the cells in the ducts of the breast. Known as infiltrating or invasive ductal cancer, this type of cancer tends to spread rather quickly to the lymph nodes. Cancers that begin in the lobules of the breast are more likely to involve both breasts. Both ductal and lobular cancer may be "in situ," meaning confined to one site or place. These localized cancers usually do not spread and some doctors recommend a wait-and-see approach, delaying surgery until the tumor changes. Other doctors might advise removing the breast right away, especially if the woman has any of the other breast cancer risk factors. Inflammatory carcinoma, which causes the breast to feel warm and look red, sometimes with a ridged or pitted look, is generally treated as advanced or late stage cancer.
Additional tests will be done to find out the stage or extent of disease. These may include x-rays, blood tests, and bone and liver scans to see if the cancer has spread. The tissue sample removed for the biopsy will be checked to see if breast cancer growth is influenced by the hormones, estrogen, and progesterone. This information could be helpful later if the breast cancer returns or recurs. If it is already known that the cancer needs estrogen to grow (and about 65% of breast cancers do), then not allowing estrogen to reach the recurring cancer can shrink the tumor in approximately two-thirds of the cases. Because it may not be possible to gather enough cells when the cancer recurs, it is important that these hormone tests be done when the cancer is first diagnosed. High levels in the blood of two substances, carcinoembryonic antigen (CEA) or cystic disease protein, may also be a sign that the breast cancer has returned or spread to other parts of the body.

Choosing a Surgical Procedure

The aim of the surgery to cure breast cancer is to remove all the tumor and a border of normal tissue around it, while saving the most amount of breast tissue, and offering the woman the best possible results in terms of appearance and being able to resume her lifestyle. Such surgery cannot, however, destroy cancer cells that have already spread through the lymph or blood. To do this, other cancer treatments are tried, such as radiation, chemotherapy, and hormonal therapy. Cancer specialists disagree on whether all patients need follow-up chemotherapy. All patients do not have the same treatment needs. These should be talked over carefully by the patient, any family and friends she chooses to involve, and members of her health care team.

There are several different types of surgery used for the treatment of breast cancer.

Lumpectomy. The lump and a border of surrounding tissue are removed. A few of the lymph nodes in the armpit will probably also be taken out and a biopsy done to see if the cancer has spread there. Even if no cancer is found in the lymph nodes, lumpectomy is always followed by several weeks of radiation therapy. Lumpectomy is usually only done for smaller tumors.
(less than 4 centimeters, or about 1.6 inches). Lumpectomy is not recommended for women with large tumors, especially those with small breasts. The difference in the size of the breasts after surgery would be very noticeable and there could be a more even match by having a mastectomy and then reconstruction.

Partial or Segmental Mastectomy. The tumor and up to one quarter of the breast tissue are removed. All or just some of the lymph nodes in the armpit are also taken out and radiation therapy usually follows.

Simple or Total Mastectomy. The entire breast is removed. For very early cancers, this is often the only treatment needed. In other cases, radiation therapy will follow. Sometimes a few lymph nodes are taken out.

Modified Radical Mastectomy. The entire breast, the underarm lymph nodes, and the lining over the chest muscles but not the muscles themselves are removed. If the woman is at high risk of having the breast cancer return, radiation therapy will also be advised. A woman planning to have breast reconstruction after a modified radical mastectomy should have the surgeon consult with the plastic surgeon before the mastectomy. The way the skin is cut to remove the breast depends on where the tumor is and the method used by the surgeon. Having the skin cut from side to side, rather than from top to bottom of the breast, may allow a woman to wear lower necklines after reconstruction.

Radical Mastectomy. This is also known as the Halsted Radical, after its originator, Dr. William Halsted, a Baltimore surgeon practicing around the turn of the century. The breast, the lymph nodes in the armpit, and the chest muscles under the breast are all removed. Afterwards, a woman may feel a loss of strength in the arm on the same side where the breast was removed, and have numbness and swelling in that arm. While this surgery results in greater changes to a woman's body, it is still the treatment of choice for those whose cancers are attached to the chest wall.
Radiation Therapy

The goal of radiation therapy is to destroy cancer cells by injuring their ability to divide, while causing the least amount of damage possible to other cells. In treating breast cancer radiation is usually used along with a lumpectomy or segmental mastectomy. Over the past several years, more and more women have chosen to have lumpectomies and radiation, rather than to have the entire breast removed. Studies have shown that for women with small tumors that have not spread outside the breast, lumpectomy plus radiation produce as good results as operations that remove more of the breast.

Radiation is usually not needed after a mastectomy, although it may be given to some women at high risk of having breast cancer recur. For women with advanced cancers, radiation may be used to help make the tumor smaller and easier to remove by surgery, or to help relieve pain caused by the spread of cancer into the bones.

The radiation can be given by a machine (external beam radiation) or by small radioactive pellets inserted into the breast through thin tubes. These implanted pellets remain in place three to four days, during which time the patient must stay in the hospital and cannot see visitors, because the visitors could be harmed by the small doses of radiation given off by the implants. External beam radiation can cause the skin in the area treated to look and feel sunburned, though this gradually fades into a tanned look. The skin may become thicker and for women receiving radiation after a lumpectomy or partial mastectomy, the breast may become firmer and smaller. If fluid builds up, however, the breast may become larger.

Chemotherapy

The strong drugs used in cancer chemotherapy cause more damage to cancer cells than to normal cells and the doctor must be very careful about how large the dose is and how often it is given. The total amount of drugs given must be enough to kill cancer cells, but not so much as to destroy too many healthy cells. Cells that happen to be in the process of dividing - both the normal and the cancerous ones - are most likely to be destroyed by anticancer drugs.
Chemotherapy may be used as the only treatment for breast cancer if the cancer is already widespread at the time of diagnosis and other means of treatment are not considered useful. More commonly, however, chemotherapy is used along with surgery, radiation therapy, or both. For this reason, it is often called "adjuvant" therapy, meaning it assists the primary method of treatment. Because chemotherapy affects a person's entire system, it is also called a "systemic" treatment, and is most often used for breast cancer patients with cancer in the lymph nodes, a sign that the cancer has spread beyond the breast. Adjuvant chemotherapy also seems to be most useful to women who have not yet reached menopause. Some medical experts believe that all women with breast cancer should have follow-up treatment with chemotherapy, but not all doctors agree. Any woman with breast cancer should discuss with her doctor how chemotherapy might help her and what the side effects might be. These side effects include nausea, loss of appetite, hair loss, increased chance of getting infections, bleeding, anemia, fatigue, and changes in the menstrual cycle. Most of these side effects stop once treatment does. Any unexpected side effects should be reported to a doctor.

**Hormonal Therapy**

Hormonal therapy involves changing the levels of hormones that help the cancer grow. Because this therapy affects the entire body and is used along with other methods of treatment, it is also a systemic and adjuvant treatment. At the time of biopsy, breast cancer cells are also checked to see if growth is swayed by the hormones estrogen and progesterone. If they are, the levels of these hormones may be changed. Years ago this was done with an operation to remove the organs that produced these hormones - the ovaries and the adrenal and pituitary glands. Today, surgery is recommended only for some cases of advanced breast cancer and the levels are usually altered with drugs. These drugs are most often used by women who have reached menopause and who have cancer in the lymph nodes. The drug most often used is tamoxifen. Common side effects include hot flashes and genital itching and bleeding.

Although it may seem odd, breast cancer patients who once were helped by having their levels of estrogen lowered may later be treated with large doses of estrogen and other hormones.
This is especially true of women who are five years past menopause. The most common estrogen drug used is diethylstilbestrol (DES). Its side effects include nausea, vomiting, diarrhea, vaginal bleeding, fluid build-up, frequent urination, changes in skin color, and bone pain in women whose cancer has spread there. The male hormone androgen may also be used and it may cause more hair to grow on the face and elsewhere.

4.4 Follow-up and Rehabilitation

Women who have been treated for breast cancer should continue to receive follow-up examinations throughout their lifetimes, since it is possible that breast cancer may return even 30 years after it was first found. A woman should ask her doctor how often these follow-up examinations should be done. Generally it depends on the type and stage of breast cancer, the type of treatment, and the risk of the cancer recurring.

Breast cancer that recurs can usually be treated, but not usually cured. Women who have had a lumpectomy and radiation and whose cancer recurs in the same breast can, however, be cured by having a mastectomy. For other patients, radiation may be used to relieve pain caused by cancer that has spread to the bones. To try to control the spread of cancer, women may also be treated with chemotherapy and/or hormonal therapy.

Rehabilitation

Most women can return to their normal lifestyles within a month or two after treatment. Many of these women are helped by the American Cancer Society's Reach to Recovery program. This is a free service to help meet the physical, emotional, and cosmetic needs of women who have or have had breast cancer. When asked to do so, carefully selected and trained volunteers who have coped well with their own breast cancers visit women who have just been treated for the disease. Together they talk over fears arising from the disease and its impact on a woman's body and self-image, and concerns for her future and her family.
The Reach to Recovery volunteer may also bring along a temporary breast form, known as a prosthesis, that a woman who has had a mastectomy can use until she can be fitted with a more permanent form. This is usually possible within four to six weeks after the breast cancer operation. The volunteer can also give information about the type of forms (polyester, foam rubber, liquid or gel-filled pockets) available and where to buy them. Depending on the patient's condition and the advice of her surgeon, the recovering breast cancer patient may also be told about exercises for the arm and shoulder on the side of the operation. The patient may also be told about ways to prevent a build-up of fluid in the arm (caused by the removal of the lymph nodes which help drain extra fluid) and ways to prevent infection in that arm, which might lead to a larger pool of fluid.

Most importantly, Reach to Recovery volunteers offer comfort and support. Patients learn that although they have had major surgery, they are the same women as before, able to love and be loved, and live fulfilling, rewarding, and productive lives. Often just the sight of another normal-appearing woman is enough to relieve feelings of depression and inspire hope for the future. Feelings of depression may include a loss of self-esteem, fear of rejection, and "Why me?" or "What have I done to deserve this?" The breast cancer patient and her family should always feel free to express concerns and ask questions of doctors, nurses, and other members of the medical team.

It is normal for a woman recently treated for breast cancer to have periods of depression, including moodiness, crying spells, feeling unworthy, loss of appetite, and lack of interest in sex. If these problems continue to last long after treatment has ended, however, professional counseling may be needed.
Chapter Five. Process Map Description

5.1 Process Overview

It is useful before beginning the process map description to understand the focus of the process description. It is clear that the ultimate goal of medicine is to heal a patient. With this in mind, it seems obvious that the patient should be the focal point for analysis. Therefore, the process map analysis starts with a high-level objective to provide medical care. From this point, the process is decomposed into five distinct activity groups taken from the perspective of the organization that must provide the care. These activity groups are breast cancer education and early detection, intervention, recuperation, case management, and payment collection.

During the data collection phase of the thesis, the process information was not available from a single source. What will unfold in the next few pages is a combination of process descriptions that came from direct interviews at the medical sites, research from library and on-line resources, and personal experiences. It is hoped that this description represents a general breast cancer treatment process that is sound and resilient to scrutiny (see Appendix A).

5.2 Initial Detection and Patient Entry into the Process

Patient entry into the care process can be viewed in two ways. First, one can view the cancer care process as a continuous system from the time the patient becomes affiliated with Acton Medical Associates and is affected by the initial screening and patient management measures. These activities help to uncover cancer in the patient at an early stage when the patient contracts the malady. Therefore, it can be argued that the patient is always in some portion of the process until she either leaves her physician’s care at Acton or contracts the malady and is cured (I hope).
A second way to view the process entry for the patient is in response to a more acute problem. Here, a patient who believes there is something wrong with her physical condition will call Acton and enter the process at the *Intervention* phase. Patient care and management should ideally be analyzed from the former view as a complete program of process control and dependency analysis because it focuses on all aspects of cancer treatment, both in and out of the provider's office.

There are three ways in which breast cancer is detected. First, the patient may conduct a breast self exam and find a lump or other abnormality. Second, the primary care physician may conduct a breast examination and find the same indications. Finally, as part of a recurring health maintenance program, the cancer may be detected from a mammography. One of these three channels introduces the patient into the acute breast cancer treatment process.

**5.3 Payment Collection**

The process of making payments for services has several components.

- Patient and employer make payments to a medical plan (insurance, HMO)
- Insurance plan makes a payment to a primary care physician (Action Medical Associates, Concord Hillside, private physician)
- Primary care physician makes a payment to specialists (oncologist, surgeon, radiologist)

We will consider the payment process from the position of Acton Medical Associates and will bill an insurance/HMO plan and collect payments in the form of insurance distributions or fees through a capitation schedule. Therefore, the *Collect Payment* process consists of *Bill Payment Provider* and *Receive Payment*.
5.4 Case Management

Case management is the administrative process to keep track of patient progress throughout the health care delivery activity to ensure the patient receives the proper care and that the quality remains high.

5.5 Early Detection Activities

Early detection activities help to diagnose the patient quickly and minimize the damage caused by the cancer cells. Once an individual joins an HMO plan and selects an Acton Medical Associates physician, they are required to undergo a physical examination. At this time, the physician will ask about the patient’s breast cancer history, mammographic rate, and how frequently she conducts self-breast exams.

Within the process of early detection are several subordinate activities. The *Provide Early Detection* activity can be divided into two specializations: *Provide Patient Education* and *Monitor Patient Health*. Let us consider each in turn. *Providing Patient Education* can be further specialized into *Educate Non-Active Patients* and *Educate Active Patients*. *Educate Non-Active Patients* means providing information to those patients who are part of the HMO program, but who have never seen a physician. This is further decomposed into three activities: *Patient Requests Information*, *Gather Information*, *Distribute Information*. These are the three essential elements of patient information distribution and are visible throughout the patient education process. It is important to note here that there is no flow dependency between *Patient Requests Information* and *Gather Information*. The two do not have to be sequentially coordinated to deliver the information. Inventory can be kept to ensure timely distribution.

*Educate Active Patients* means educating those patients who have been seen by their primary care physician at least once. There are three specializations for this activity: *Provide Literature on Request*, *Teach Patient Self Breast Exam (SBE)*, and *Answer Questions*. Each
of these three specializations inherit the same decomposition structure from Provide Patient Education that is visible in the Educate Non-Active Patient specialization. To reiterate, these process descriptions represent ongoing activities to educate the patient before she contracts the malady.

The Monitor Patient Health specialization refers to those activities that the primary care physician undertakes to manage the health of his/her patients. There are four specializations of this activity: Perform Initial Physical, Perform Regular Mammograms, Track Patient Records, and Perform Follow-up Evaluations. Perform Initial Physical is the activity of establishing the initial baseline physical and mammography, if required, for the patient. Since much of the diagnosis pattern is based on noticing changes within existing condition, this is a particularly crucial activity. Perform Regular Mammograms is further subdivided into three decompositions: Recommend Mammogram, Perform Mammogram, Assess Patient Mammography Rate. Under this process the physician recommends that the patient get annual mammographies and will schedule the mammographies for the patient. As a follow-up activity, the physician assesses the mammography rate to ensure the patient is receiving appropriate care. The Track Patient Records specialization is the physician’s individual monitoring of the patients condition while under his/her care.

The Perform Quality Audits specialization is the management tool to ensure proper care is being delivered. This is done by the HMO/Insurance as represented by Perform HMO/Insurer Audit and compares health care delivery indicators with industry norms. It is also performed internally at Acton by performing periodic audits on patient records (Perform Annual Audit) and performing an audit on a diagnosis that was changed or otherwise incorrect (Perform Event Audit). Both these decompositions share essentially the same decomposed process: Gather Data from Patient Records, Review Record, and Determine and Take Corrective Actions.
5.6 Medical Intervention Activities

The *Provide Medical Intervention* process is the heart of the breast cancer treatment process. It is decomposed into four major components of intervention: *Diagnose Patient, Choose Treatment Options, Perform Intervention, and Move Patient.*

5.6.1 Diagnosis Activities

The diagnostic activities can be seen as several sub-diagnoses that are put together in order to determine the nature of the malady and what should be done to treat the patient. The general diagnosis process consists of six distinct steps. These steps are: 1) *Review Chart;* 2) *Question Patient;* 3) *Examine Patient;* 4) *Consult References;* 5) *Consult Specialists;* and 6) *Confirm Patient Condition and Record.*

Within the *Diagnose Patient* activity, *Examine Patient* is further sub-divided into three specializations: *Establish Current Condition, Examine Patient Condition,* and *Perform Diagnostic Tests.* These three activities of the process inherit a four-activity process decomposition that includes the following activities: *Prepare Patient, Perform Procedure, Analyze Results,* and *Add to Patient Record.* Within *Examine Patient Condition,* *Order Diagnostic Test* is added as a final activity that triggers the *Perform Diagnostic Test* process.

Within the *Diagnose Patient* activity, *Consult References* and *Consult Specialists* are further sub-divided into a three activity decomposition: *Get Resource, Read/Talk to Resource,* and *Make Judgment.*

The different sub-diagnoses are specializations and are presented below.
**Triage Nurse Assessment**

Virtually all patients (95%) enter the treatment process by first consulting a triage nurse. Patients call the triage nurses who question patients using a Kardex file and their own knowledge to identify the patient's problem. Acton Medical Association develops its own triage system based on the Kardex and inputs from physicians and nurses. Individual experience is crucial to identify problems and get the patients into the treatment process as needed. Nurses record all communication between them and the patients. Once the call is completed, a message goes to the patient's primary care physician for review before it enters the medical record. If needed, the nurse transfers the patient to the appointments desk where she can make an appointment to see their doctor.

**Primary Care Provider (PCP) Diagnosis**

The PCP begins his/her diagnosis by reviewing the patient's chart before the patient arrives for the appointment. The PCP will also consider all information that was collected about the patient's current condition. Once the patient arrives, the PCP will take an oral history. Next, the PCP will examine the patient. First, the PCP will assess the patient's current condition by observing the patient's state of mind, emotional state, and physical appearance. Then the PCP will conduct a breast examination. Finally, if warranted, the PCP will order and/or conduct diagnostic tests. The *Perform Diagnostic Tests* is specialized into four different tests: *Perform X-ray Examination, Perform Blood Test Examination, and Perform Liver Scan Examination.*

Once the examination is completed, the PCP will consult reference material and specialists. The PCP will then make a diagnoses and determine further specialist diagnostic options represented by the *Determine Referral Option* activity.

**Radiological Diagnosis**

A patient who is in need of a mammogram is referred to a radiologist at Emerson Hospital. Those patients that are part of an HMO plan must see one of Acton's designated radiologists. Indemnity patients are free to see their own specialist, but are typically referred to Emerson.
The radiologist is active throughout the diagnostic process and his/her activities are completed at different times during the diagnosis.

When the patient first sees the radiologist, he/she reviews the patient history and associated information. The radiologist then will question the patient and explain the mammography procedures. Then, the radiologist examines the patient. The *Examine Patient* activity is decomposed into *Perform Mammography* and *Compare to Baseline Mammographies*. Once these tasks are completed, the radiologists consults references and the surgeon and confirms the patient condition and records in the patient record. These results are then passed to the surgeon for further action.

After the surgeon examines the patient, the radiologist may again help to diagnose the patient by reviewing the patient’s chart (written test results) under the decomposed process: *Review Patient History and Review Biopsy Results*. This is a joint activity with the surgeon to close in on the appropriate diagnosis.

*Surgical Diagnosis*

Once a suspicious breast lump is found and the mammography is completed, the PCP may wish to have a surgical diagnosis performed. The purpose of this diagnosis is to confirm whether or not the lump is malignant or benign. The surgical diagnosis begins by reviewing the patients chart and questioning the patient. *Question Patient* is decomposed into *Take History* and *Explain Procedures*. The *Examine Patient* activity is next.

*Examine Patient* is further specialized into two sub-processes: *Perform Needle Biopsy* and *Perform Diagnostic Lumpectomy*. The *Perform Needle Biopsy* specialization is again specialized into *Perform Frozen Section Biopsy* and *Perform Paraffin Block Biopsy*. These two specializations inherit the *Perform Needle Biopsy* decomposition which is represented by *Prepare Patient, Perform Biopsy, and Move Patient*. After these activities are complete, the surgeon consults references, does not consult a specialist (since he/she is the specialist), and
confirms the patient condition and records it in the patient’s record. The sample is passed on for pathological diagnosis.

Pathological Diagnosis
The pathologist receives the lab request by *Review Lab Request*. He/she then will test the specimen. The *Test Specimen* is specialized into two specializations: *Test for Cancer* and *Test for Hormone Sensitivity*. Once the sample is tested, the pathologist will check the sample against medical norms. The *Check Against Norms* activity has two specializations: *Check Against Clinical Norms* and *Check Against Patient Baseline*. Once these norms are compared with the sample condition, the pathologist will confirm the sample condition. *Confirm Sample Condition* is specialized into: *Pathologist Evaluation* and *Pathology Department Evaluation*. These activities inherit the general process of evaluating the results and are partially modified. *Pathology Evaluation* is further decomposed into *Review Findings* and *Make Judgment*. The *Pathology Department Evaluation* activity is decomposed into *Present Judgment* and *Confirm Judgment*. Once these activities are performed, the pathologist records the findings in the patient’s chart.

The pathologist passes the information to the radiologist and/or the surgeon. The surgeon then decides whether to re-excise the lump, provide radiotherapy, or take other measures for treatment.

Oncological Diagnosis
The oncological diagnosis follows the simple decomposed diagnosis process. The oncologist reviews the patient’s chart, questions the patient, examines the patient, and consults references. The oncologist will also Check for Pharmacological Conflicts to make sure the patient can receive chemotherapy if needed. Then the patient’s condition is confirmed and recorded.
5.7 Treatment Selection

Treatment selection is a process that involves the patient, the PCP, the surgeon, the radiologist, and a Tumor Review Board. The Select From Treatment Options is specialized into Generate PCP Treatment Choice and Generate Review Board Choices. These specializations are further decomposed into their respective activities. Generate PCP Treatment Choice includes: Assemble Patient, Discuss Options, and Select Treatment. The Generate Review Board Choices specialization decomposes into: Assemble Review Board, Discuss Options by Reviewing Record, and Select Treatment. The review board acts as a second opinion for the patient and reviews the adequacy of the treatment prescribed.

5.8 Treatment Activities

The basic intervention steps are: Prepare Patient, Perform Intervention, and Move Patient. Prepare Patient is decomposed into five steps: Review Patient Chart, Question and Educate Patient, Cloth Patient for Procedure, Administer Medication, and Move Patient. Perform Intervention is decomposed based on the surgical specialization.

The choice of treatment depends on the stage of the cancer (whether it has spread to other places in the body), the type of cancer, certain characteristics of the cancer cells, and age, weight, menopausal status, and general state of health. In general, there are four treatments that are used: Surgery, Radiation Therapy, Chemotherapy, and Hormone Therapy. In the process representation, Chemotherapy and Hormone Therapy have been combined and Psychological Treatment is added as an ongoing treatment process throughout the entire breast cancer treatment process.

Surgery

This is the removal of the cancer in an operation and includes lumpectomy (removal of a lump), and partial, total, and radical mastectomy. Breast tissue is removed and reconstruction
can be done concurrently or later. There are seven specializations for Perform Intervention:

- Perform Lumpectomy
- Perform Partial Mastectomy
- Perform Total Mastectomy
- Perform Modified Radical Mastectomy
- Perform Radical Mastectomy
- Perform Reconstructive Surgery
- Perform Gland Removal

Radiological Treatment
This is the application of high-dose x-rays to kill cancer cells. This procedure follows the basic three-activity decomposition. The Perform Intervention step is Treat with Radiation.

Chemotherapy
This is the use of drugs to kill cancer cells. For women where the cancer has spread to the lymph nodes, systemic chemotherapy has important effects on early survival. Typically, combinations of drugs are used and can offer a high remission rate. Sometimes hormones and chemotherapy are combined, but the benefits of this treatment are not totally understood. This procedure follows the basic three-activity decomposition. The Perform Intervention step is Administer Medication. This step is then specialized into Provide Chemotherapy Treatment and Provide Hormone Treatment. These two specializations inherit the decomposition structure of Provide Chemotherapy: Prepare Patient, Administer Drugs (or Hormones), and Move Patient.

Hormone therapy is the management of the hormones in the body that help cancer grow. This can be accomplished by using drugs to stop cancerous cells from growing. This choice is usually considered for advanced breast cancer and may include the introduction of estrogens and androgens. Hormonal manipulation can be expected to give high response rates in steroid receptor positive patients, but responses may take time to become evident. Removal of organs, such as ovaries, can also be performed.
Psychological Treatment

This is the ongoing counseling and psychological treatment throughout the diagnosis, intervention, and rehabilitation stages. It has the same three process activities: Prepare Patient, Perform Psychological Treatment, and Move Patient.

5.9 Rehabilitation and Follow-up Activities

The prevention of further breasts cancer is a primary goal for the cancer patient. This can be accomplished through self breast examinations, yearly mammographies, and careful clinical breast examinations at each follow-up visit. Rehabilitation of the patient should be physical as well as psycho-social. Efforts for rehabilitation include therapy to overcome limited shoulder motion, arm edema, and stiffness of the chest wall. These include:

- Breast reconstruction - the use of implants to simulate the breast.
- Arm exercise programs - to improve range of motion after surgery or radiation.
- Emotional rehabilitation programs to counsel the patient.

The process map decomposes the Provide Recuperative Medical Care into Assess Medical Condition, Perform Recuperation, and Move Patient. The Perform Recuperation has two specializations: Provide Counseling and Provide Physical Therapy.
Chapter Six. Process Handbook Analysis

Once the process map is complete, it is time to perform an analysis to understand where improvement and invention opportunities exist.

6.1 Generic Processes

To begin the process analysis, a useful exercise is to identify those sub-processes that are common or recurring throughout the process. Once this is accomplished, the process elements can be disaggregated into those that are core to delivering health care and those that are present to coordinate the core activities of the process. In the case of the breast cancer treatment process, there are four major generic processes: Provide Medical Care, Perform Diagnosis, Select from Treatment Options, and Perform Intervention.

At the highest level of Provide Medical Care, there are only three core process activities:

- **Diagnose the Patient.** The provider needs to know the current state of the patient is to know if he/she needs treatment and what type to provide.

- **Perform the Intervention.** The provider treats the ailment.

- **Perform the Recuperation.** The provider provides post-intervention treatment to try to return the patient to her original state of health.

The graphical view of this process is diagrammed in Figure 6.1.
The next generic process is the *Perform Diagnosis* process. In this process, there are six core process activities:

- **Review Chart.** The PCP reviews the patient’s chart to learn more about the patient’s history and begin diagnosing, with the information available from the triage nurse assessment.

- **Question Patient.** The primary information source, with *Examine Patient*. The patient is asked questions to help understand the nature of the problem and the patient’s susceptibility to different maladies.

- **Examine Patient.** The primary information source, with *Question Patient*. The patient is physically examined by the PCP for symptoms.

- **Consult References.** The PCP can refer to his own knowledge, literature, and other reference materials.

- **Consult Specialists.** The PCP can refer to other PCPs, physicians, nurses, and specialists for additional information and advice.

- **Confirm Patient Condition and Record.** The PCP makes a diagnosis and records it in the patient’s records.

The graphical view of this process is diagrammed in Figure 6.2.
The next generic process is the Select from Treatment Options process. In this process, there are three core process activities:

- **Assemble Stakeholders.** All parties who are required to make the treatment selection decision must be assembled so that their input can be communicated to the group.

- **Discuss Options.** The stakeholders discuss the options for treatment.

- **Select Treatment.** The stakeholders select a treatment option.

The graphical view of this process is diagrammed in Figure 6.3.
The final generic process is the \textit{Perform Intervention} process. In this process, there are only three core process activities:

- \textit{Prepare Patient}. This activity provides the patient with procedural information, clothing, and/or medication to prepare the patient for the intervention.

- \textit{Perform Intervention}. The physicians perform the intervention activity.

- \textit{Move Patient}. The patient exits the process.

The graphical view of this process is diagrammed in Figure 6.4.

![Figure 6.4 Generic Perform Intervention Process](image)

These generic processes can be seen throughout the breast cancer treatment process (see Appendix A). Elements are sometimes modified, but the basic structure is shared and inherited at many levels of the process. This becomes important as the organizational designer looks to other environments for similar processes. By comparing generic processes, the designer can identify like dependencies and select alternate methods of managing these dependencies by using new coordinating mechanisms borrowed from the sister process.

Although these generic processes are in place, the process is not entirely predictable. Consistent with most areas of medicine, the treatment of breast cancer does not follow a specific path of discrete activities. There are waypoints along the diagnostic and treatment
path that allow physicians and other medical care providers to make discriminating decisions for the future care of the patient. Consequently, this makes the mapping and analysis of the “process” difficult because there are many sub-process possibilities within the structure. The Process Handbook can still present the process adequately. Actors moving through the process will choose a different set of activities each time they pass through the process. That means that the organizational designer cannot simply concern himself/herself only with the optimal treatment path. Instead, he/she needs to consider an organizational form that will allow many process paths and choose coordinating dependencies that will enable these options to unfold satisfactorily.

To assist the analysis of health care delivery process and what might be called human maintenance, we will compare it throughout this thesis to another form of maintenance: the care and maintenance of jet fighter aircraft in the United States military. In this case, a United States Air Force F-15 aircraft will serve as the patient and the aircraft maintenance organization (AMO), staffed with maintenance personnel and equipment, will serve as the care and maintenance support organization. This parametric analysis is a standard method of analysis for the Process Handbook and will serve as an illustrative example for comparison.

The process of repairing a specific component on an aircraft is much like treating a patient. The major departure in similarity (besides the fact that one is an organic being and the other is an inorganic machine) is the individual uniqueness of each unit. Each aircraft and aircraft component, in contrast to the human system, is relatively the same. The same repair process can be used for each aircraft with a specific ailment (e.g. an inoperative fuel pump). However, as has just been noted, the breast cancer treatment process is a series of variable sub-processes. This is a desirable trait, because unlike replacing the aircraft fuel pump, we do not want to require that cancer treatment be the same for each component (human) in the process. Instead, we want to design a robust process that will accept many different patient conditions and produce a variety of acceptable treatments.
At the onset of the mapping process and the search for generic processes, an interesting thing happened. It became apparent that depending on the focus of the mapping approach, the process could look very different. It appeared that, in the act of choosing the process goal, the designer provides the foundation for the process mapping. In a previous attempt to model health care, students and faculty from Babson College tried to map the activities of Marlborough Hospital. Their focus was running a hospital and was represented by their most superior activity: Be a Hospital. Although their process has many similarities to the process in question, their hospital focus influenced the way the process is now represented in the Process Handbook. Without considering the Marlborough case during the breast cancer treatment process mapping, differences emerged in several significant ways. In this thesis case, the patient was purposefully placed at the center of the activity and the activity description was chronicled around how to provide the specific service to the patient instead of run a hospital. In some sense, the thesis process could be a subset of the Be A Hospital process. A word of caution for Process Handbook users: the structural form of the process should be consistent with potential parent process to allow fusion at a later time. The Marlborough/breast cancer treatment process merger will rely on the activities and process structure that are common to both and will give a richer description to the health care process.

This means that during the course of describing a process, the final appearance will depend on several factors:

- Who the actors are. The process of running a hospital will have a different representation if a nurse maps it rather than the chief surgeon, because of their unique point of view and their perception of the process.

- From what perspective the process is taken. A process map of breast cancer treatment may look different depending on how the care is structured. Performing a biopsy can be represented as a diagnostic procedure or a surgical intervention. This difference will clearly alter the process representation and influence the ability of the Process Handbook to make extra-organization comparisons.
Although there is no single representation that is correct, the process that is entered into the Process Handbook should be representative from all actors'/designers' points of view. By using hierarchical representation schemes, the process could provide the option of seeing different views depending on who is looking at the process. Business managers and head surgeons, for example, could look at the same process, but along dimensions that are important to them.

6.2 Decomposition

The decomposition of the goal again was influenced strongly by the orientation chosen for health care. Five major elements were chosen to represent the process: Collect Payment, Perform Case Management, Provide Early Detection, Provide Medical Intervention, and Provide Recuperative Medical Care. The decomposition was chosen so that managers could see the relationships of activities at different stages of care. The Collect Payment process element was expressly separated from the practice of delivering care to allow managers to focus their dependency analysis on the clinical and non-clinical aspects of the process. The description of the decomposition activities attempted to move the process from a hospital/physician focus to a patient-oriented treatment process. It is hoped that by focusing on the subject (that which the process will create, alter, and/or transform) of the process, the analysis will be aligned with the most crucial attributes.

Appendix A shows the decomposition of the process. Appendix B shows the corresponding activity matrix that outlines the process elements considered important for analysis. The process representation and activity matrix form the basis for the analysis that follows.

Some areas that were more accessible to research are detailed more thoroughly. Even with complete access to data, it is important for the process mapper to determine where to stop the decomposition. For instance, Consult References could be decomposed into many different activities for acquiring materials, conducting the literature search, and making comparisons.
Limiting the scope not only saves time, but also focuses the analysis at the proper level that will yield the most insights without getting caught in entangling details.

In its current state, activity representation in the Process Handbook should be more detailed. Through the use of software links and sub-level representation, designers should be able to select an activity, "double click" on the activity, and get a wide-selection of activity attributes. Candidate attributes might include:

- The usual actors. These are the individual actors who are usually or typically involved in the activity.

- Goals. The individual goal or goals of the activity as they relate to the actors involved.

- Artifacts. Those "things" that are used to coordinate the activity (e.g. forms, contracts, tracking records).

- Dependencies. The other activities or factors that the successful completion of the activity depends on.

- Dependency types. References made to the general dependency types presently identified.

- Coordinating mechanisms. Those management mechanisms in place to control the activity flow.

6.3 Inheritance and Specialization

Each of the four core processes and several other process representations are inherited throughout the process map. Not only are the activity structures inherited, but the dependencies are inherited as well. The inheritance feature helps designers understand the offspring process by providing a reference structure to map the process. Designers should not attempt to force-fit process elements into an inherited structure. If the offspring process does not match its parent, the designer may be mistakenly representing the parent decomposition.
Conversely, it is through design and comparison that insights are uncovered. A major insight might come from the designer who notices that the sub-process does not exactly inherit the qualities of the parent structure. A unique specialization structure may have been discovered that provides an unexploited alternative.

It has been said that all processes are specializations of higher level processes. When a process can be accomplished two different ways, specialization occurs. In the breast cancer treatment process, the specialization of activities occurred at every level. There are two major areas where specializations are numerous: diagnosis processes and intervention processes (specifically surgical intervention). The diagnostic process, for example, spreads across many organizational boundaries. As the patient enters the cancer treatment process, they encounter as many as six different providers all trying to complete a sub-diagnosis that contributes to the overall diagnosis. Each basically follows the same activity steps, but does so adding a different component to the patient’s diagnosis. In the intervention phase of treatment, each of the different surgical procedures, from lumpectomy to mastectomy to gland removal, follow the same decomposed process as specializations.

### 6.4 Dependency Analysis

#### 6.4.1 General Dependency Analysis

There appear to be three distinct dependencies resident throughout the breast cancer treatment process. These are: 1) shared resources; 2) producer/consumer relations; and 3) simultaneity constraints.

*Shared Resources.* Medical personnel are in finite supply and their services must be shared. The patient’s medical records must be available to multiple providers throughout the diagnosis and intervention stages. Hospital and physician office resources are in scarce supply and require coordinating mechanisms to sequence use. These resources are managed by a first
come/first serve mechanism coupled with “severity of malady” mechanism. Those with the worst afflictions are treated first.

Prerequisite Constraints (Producer/Consumer Relationships). The entire medical process attempts to manage producer/consumer relationships. Often, further steps through the process are triggered by previous activities. A pathological diagnosis must be made before surgery can be performed; a tissue sample must be drawn before a pathological diagnosis can be made; and approval from the insurer, in many cases, is required before any of these can be conducted. Unlike most manufacturing processes where the desire to complete the entire process is determined before the first activity starts, medical care is a step-by-step process where activities are completed as they are needed.

Inventory (Producer/Consumer Relationships). Although this is an important consideration in health care delivery (managing medical resources, inventory of patients and communication), the level of detail examined is not sufficient for appropriate analysis.

Usability (Producer/Consumer Relationships). The usability of common information systems is critical to communicating accurate patient history. For instance, all practitioners must possess common x-ray viewing equipment if they are to understand the patient’s condition. Records must contain language and formatting that is universal and easily understood. Equipment used on the patient must fit the patient needs without imposing unnecessary discomfort or cause ill side effects. Informal medical traditions and formal protocols have combined to ensure practice usability over the years.

The flow dependencies (producer/consumer relationships) are evident throughout the process. This is because virtually all of the activities elicit a response from the patient and further treatment and/or testing is based on this response.

Simultaneity Constraints. Scheduling is a major activity for coordinating the process. Once a patient is diagnosed with a malady, quick and accurate scheduling is a key factor in the
efficacy of the patient's treatment. Synchronization is also important. All members of the Tumor Board, for example, must meet at the scheduled time to review patient diagnoses. The coordination of simultaneous treatment gives the patient the most improvement in quality.

The approval dependency also plays a major role throughout the process. The approval process is not unique to the health care industry, but is used in virtually every organization to coordinate three dependencies:

- **Shared Resource dependency** - travel budgets and expenditures are managed through a supervisory approval process to ensure that the right allocation of money is made without exceeding a maximum budget.

- **Shared Output dependency** - engineering change requests during a design process are managed to ensure that the engineering changes will improve the current design without adversely impacting the remaining elements (including cost) of the project.

- **Quality Control/Informing dependency** - maintaining a prescribed level of quality can be managed by an approval process on forms and reports. This mechanism also acts to inform managers. This informing gives the leader a sense of how the organization is performing and helps him/her decide where and when to make management adjustments.

Approvals to expend financial resources intertwine with approvals to exercise treatment. It appears that where these two intersect, there may be faulty decision/coordinating mechanisms that results in medical decisions that are made to lower costs at the expense of quality. A more vibrant approval process might be one the stresses demonstrable performance rather than hierarchical control. This “market-driven” process, though, will need a sophisticated information system that can predict outcomes for new policies that do not use the strict approval process and a system that can communicate these results to stakeholders.
We should not confine our analysis to single dependencies between adjacent activities within a process. Instead, designers should consider groups of dependencies and seek coordinating mechanisms that can improve, modify, or eliminate chains of activities. Figure 6.5 shows a graphical representation of how managers should think across dependency groups.

**Figure 6.5** Alternate ways to view of dependencies

By doing so, they can alter several dependency coordination mechanisms at the same time and observe the new process effects. For instance, the process of taking vital signs has several resource dependencies associated with it. Figure 6.6 shows the process of considering a group of dependencies for management.
Figure 6.6 Process transformation through grouped dependency analysis

Here, the process steps have been rearranged and consolidated by deconflicting shared resource use. Since pulse and temperature can be taken together without interference, but blood pressure measurement will interfere with these measurements, the process is transformed as indicated. This would not have been possible unless all three activities were considered together.

6.4.2 Specific Dependency Analyses

There are numerous opportunities throughout the breast cancer treatment process to make observations about the activity dependencies and the coordinating mechanisms that attempt to manage them. The more interesting examples and their implications are presented below.

Case management as a coordination mechanism

It appears that the entire existence of the case management process is to coordinate activities. The case manager considers the continuum of care for the patient and, with the knowledge of the process, considers ways to link care and payment activities for each patient. The case
manager follows the patient through the process and oversees her care from a financial and logistical point of view.

There is no question that the case manager is part of the health care delivery process. Through a close relationship with the payment specialists and the medical specialists, the case manager is an integral member of the continuum of care. The case manager acts as a patient advocate and a coordination agent to make sure that the patient sees the actors in the process that are needed. The case manager also informs the patient of the choices that are available to her and provides a component of oversight that the current process needs. The existence of this role proves the great need for coordination to manage the dependencies that pervade the different care continuum activities.

In a way, the case manager supplements the "managed care" activities of the PCP. The case manager and the PCP are the main coordinators of the continuum's activities. By teaming, maintaining a close relationship, and making use of sophisticated information technology support tools, these individuals can profoundly improve the health care delivery process. The concept is the selective management of the delivery of information. Routine, predictable, and recurring information and services can be delivered to the patient and the health care providers automatically through expert systems that help manage patient records, treatment histories, and billing. Unique services and those that are enhanced by getting the provider closer to the patient should be performed by the provider. The case manager teamed with the PCP could effectively manage the complete administrative and clinical process for the patient. For instance, instead of requiring PCPs and case managers to ensure that a patient who had a lump detected actually made an appointment to see the radiologists, a patient "tickler" system could be developed to automatically alert care providers on an exception basis. This system, and systems like it, would not replace these providers, but free them to spend more time (a shared resource) with patient contact.
Consider Figure 6.7:

![Figure 6.7 Actors in the continuum of care](image)

If these actors, acting together, form the continuum of care, then information technology improvements can bring each of them closer, tightening the seams between their sub-processes, and presenting more unified care to each patient. This is because less coordination is required for each process when dependencies are alternatively managed through information technology systems. Since the patient invariably sees a mix of both the coordinating and core activities as they pass through the process, one would expect the core activity to clinical activity ratio to increase. Furthermore, one measure of health care process effectiveness and quality could be measured as a ratio of time or effort spent accomplishing coordinating activities versus time or effort spent accomplishing core activities. The relationship might be:

\[
\text{Process Effectiveness} = \frac{\text{Time/Effort Spent Accomplishing Core Activities}}{\text{Time/Effort Spent Accomplishing Core and Coordinating Activities}}
\]

**Benefits from Group Practice**

Many of the coordination mechanisms that are in place exist to coordinate the activities among the principle actors who perform the activities of the process in relative isolation. Solo practice PCPs and specialists require sophisticated information notification, scheduling, and sequencing systems to coordinate multi-disciplinary diagnoses and treatment. In a group setting, standard procedures, like specialist referral and billing, can be devised to minimize the time each practitioner must dedicate to this function. By contracting and negotiating across
boundaries while dealing with a much larger patient membership, groups can experiment with different coordinating mechanisms many times and choose the ones that are the most beneficial.

The informal exchange of information and expertise cannot be overlooked. While researching this thesis, interviewees commented on the informal network that exists between professionals within group boundaries and outside the group. These ties form channels through which information flows. Coordination happens, *de facto*, because colleagues are in the same space. The use of space is a low technology solution to a very old coordination challenge. When practitioners have access to their partners and can see other activities within the process, dependencies are managed through understanding and empathy.

*Benefits from Automatic Approval*

Much of the dependency analysis showed that many activities were selected, started, and terminated based on some sort of approval coordination mechanism. Most of this approval concerned payers who needed to confirm care procedures and clinicians seeking approval to ensure the adequacy of care. Decentralized activity approval systems could help streamline processes while reducing cycle times. Instead of having to contact insurers and HMOs for practice approval, PCPs could verify coverage through an on-line query system. Specialists, using the same system and organized in a network arrangement with the other actors of the care delivery system, could make decisions without the question of financial coverage. Pre-approved coordinated mechanisms is the answer to approval dependency shortcomings.

6.5 Further Process Handbook Efforts

Although the Process Handbook adequately represents many important aspects of a process, it does not appropriately represent the time differential between activities. Designers should evaluate coordinating mechanisms on their ability to manage dependencies from a temporal sense, that is, how well the mechanisms either shorten the time between activities or how well the mechanisms deal with activities that are necessarily time displaced. It seems plausible to
assume that by changing the way a dependency is managed through the use of a synchronization mechanism, the process could be sped up. This improvement, although it makes a sub-process more efficient, could have an adverse affect on the process as a whole by pulling other activities out of alignment. Therefore, systemic adjustments should be made in conjunction with activity-by-activity modifications.

The effects for a medical delivery process could be substantial if the temporal aspects of the process could be better managed. One way to capture the effect is through simulation. The system dynamics modeling tool will be explored later to highlight possible applications.

The fact that there are many different process paths presents an interesting situation during process design. How does the designer set up the process to aid the actor who will execute the activities of the process? Are there mechanisms that can be put into place to assist decision making, which is a vital element of the process.

The breast cancer treatment process requires the actors to make decisions during the process that alters the process path. A decision point in a process is different from a specialization. In a process that is divided into specializations A and B, for example, we can perform either specialization A or specialization B without requiring that the choice be based on previous activities. For instance, in a process called “Sell Hot Drink”, the choice to sell coffee or tea is independent of any previous activity. We can sell coffee today, sell tea tomorrow, or indulge in any other combination. Conversely, a decision point requires a mutually exclusive selection. When an F-15 aircraft’s main landing gear strut is leaking hydraulic fluid, we can either repair the strut by repacking the piston and cylinder seals or we can replace the strut entirely. But this decision depends on the current state of the process (e.g. availability of replacement parts, skilled technicians, time). This decision point obviously depends on a designer’s frame of reference within the process. At some point in time, the strut will be repacked (maybe not on the flightline, but back in an intermediate-level or depot-level maintenance process). But we are concerned here with activities that affect the principle actors in the process.
Dependency representation becomes complicated when a process has two or more possible pathways. Producer/consumer relationship dependencies need an alternative representation to show the possibility of two process paths. One possible way to represent this is through the use of "dotted line" dependencies. These dotted line dependencies show the flow relationships between two alternative specializations. The dotted line indicates that there is a choice on the first pass through the process among the multiple specializations. Figure 6.8 shows the representation.

![Diagram of dotted line dependencies](image)

**Figure 6.8 Dotted Line Dependencies**

As the patient moves through the process, this representation could be used to map the customized process with each pass.

There is a relationship between activities that should be explored. These mutually exclusive choice points are pivotal points in the process flow. The course of the process is typically selected based on two contingencies: 1) the recommended next step as a result of the completion of a prerequisite (or upstream) activity; and 2) the capabilities of the downstream activity to continue the process with the inputs provided. During simulation, the Process
Handbook could use a interrogation scheme to make choices. This interrogation routine would essentially pit upstream activities against downstream activities for suitability. An upstream process activity would interrogate two or more downstream activities. The Handbook would then select the next process step based on the condition of the patient, the availability of resources and the adherence to sequencing protocols, and the inputted needs of the designer. The Handbook could further track performance and make recommendations so the designer could see how changing the process structure and dependency management methods altered the organization’s performance.

Finally, the Process Handbook does not adequately show the dynamic behavior of processes or the feedback effects of coordinating mechanisms. The Handbook either needs to be enhanced to provide this feature or linked with existing tools (such as system dynamics) to show this process behavior.
Chapter Seven. Incentive System Comparisons

7.1 Nature of Incentives

Arguably one of the most important aspects of the organization and maybe the least understood are incentives. The motivational energy that moves individuals through their daily activities can profoundly impact the choice of coordinating mechanisms a designer chooses for his/her organization. Sufficiently harnessed, a person’s incentives can eliminate elaborate coordination mechanisms because the need for this control is reduced when individuals are provided the tools and the incentives to coordinate themselves.

This chapter looks only at physician incentives and the role of these incentives in the organization. This was done for simplicity. The analysis is equally applicable to the other essential actors who make up the health care delivery process, but who are not specifically addressed here including physician’s assistants, nurses, nurse practitioners, and orderlies. Designing a comprehensive incentive system that integrates the needs of all of these actors will have the greatest impact on the organization’s performance.

Physicians are directly affected by the current changes in the health care industry. There are five major developments that are affecting physicians and their practices\(^23\). These developments are:

- **Growth of Managed Care.** Managed care is exerting a severe downward pressure on physician compensation.

- **Shifting the Risk.** Managed care is increasingly shifting the financial risk of care through a billing scheme called capitation. Capitation is a payment methodology based

on a number of covered lives times a predetermined rate for a defined set of covered services. It is usually expressed as so many dollars per patient per month. Capitation is used by HMOs to shift the insurance risk of coverage from themselves to the physicians. However, this scheme can provide for a steady stream of income for physicians if managed properly (e.g. healthy patient groups, close accounts payable management, and adequate investment in prevention measures).

Containing Costs. Strict utilization review procedures are prompting the development of practice parameters, protocols, outcomes analysis, and quality standards that will influence how medicine is practiced. These standards attempt to unify practices and provide a meeting point for insurers to dictate treatment careplans.

Primary Care. As managed care grows, primary care physicians will play an increasingly important role in the delivery of health care.

Physicians and Hospitals. Hospitals in virtually every major market throughout the country are developing strategies for securing their physician referral base so as to protect and expand their markets in the face of shrinking demand and increased competition.

These pressures are making some of the traditional incentive elements obsolete. The approach to designing appropriate physician incentive systems should probably start by looking at what physicians are trying to do and under what model we believe the physicians are operating. There are three generally held models of physician behavior that bear description before we consider ways to provide incentives for physicians. These models are²⁴:

Profit Maximization Model. Under this model, the physician can be thought of as a small business-person and will try to maximize his/her profits for whatever worl

he/she can get. This model indicates that the prevailing decision factors will be how to impact the bottom-line over the long haul. The key behavior in this type of model is what is called “demand inducement”, whereby physicians encourage patients to demand larger quantities of services at a given price (three follow-up chest x-rays instead of two, for instance).

**Target Income Model.** Doctors have a target income, rather than a maximum possible income, as an objective. The idea is that there are some services that the doctor knows are most appropriate in certain situations and that patients would demand if given accurate, complete, and perfectly truthful advice. This “cost of conscience” limits what the doctor will prescribe as opposed to merely a strict profit maximization model.

**Patient Agency Model.** This model espouses a view that the physician seeks primarily to serve as the patient’s advocate and agent. The physician makes decisions based on what he/she believes is in the patient’s best interest regardless of profit and loss.

Further complicating physician behavior prediction are the physician needs that have surfaced in light of health care reform. A recent study examined those items that physicians hoped most to gain from networks vying to acquire their practices. These included: 1) relief from administrative work; 2) the freedom to concentrate on patient care; 3) steady income; 4) the ability to transfer practice equity to a cash asset; and 5) access to capital.

It is fair to say that there are wide variations from physician to physician in what motivates them to practice medicine. For the sake of this analysis, we will assume that physicians have primary and secondary incentive focuses. Primarily, physicians want to provide high quality medical care and serve as the patient’s advocate. Secondary factors that today’s physicians must consider are: 1) delivering cost-effective medicine; 2) making the transition from fee-for-

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service (FFS) to managed care service; 3) managing and reaching service performance goals in a competitive market; and 4) adjusting to being salaried employees. Given this, we are given the opportunity to design incentive systems that make it worthwhile for physicians to practice while keeping costs down and quality up.

A possible focus point for invention is the way in which specialists are managed from the primary care physician's perspective. There are three choices here. The specialist can be paid on a fee-for-service basis with itemized billing, on a fee-for-service basis with global payments, or on a sub-capitation basis. The PCP, as the patient's advocate and health manager, should be the hub of the health delivery effort. Whatever the payment scheme, the process designer will need to link the efforts of all actors to get the most care for each patient that passes through the process while recognizing individual contributions and compensating those actors accordingly. Before suggesting alternatives, we must consider the role of incentives.

7.2 Role of Incentives

Whenever we attempt to design an organization, we usually start our construction with the "hardware". This includes the job descriptions, communication systems, and the physical structures that those who will be operating in this environment will need to succeed. Although these are essential elements in order to facilitate work, they are by no means the end elements of the design process. The soft variables are arguably the most important elements the designer must consider. This is true for several reasons. First, managers find it difficult to create appropriate incentive systems because most people find it difficult to understand what truly motivates individuals. Most can understand the assumptions and premises of a net-present-value analysis for a project. Considering the appropriate incentives for a group of highly educated professionals is a different matter. The designer must give a great deal of attention to these factors.
Second, incentive systems have their place alongside production and administrative systems and play a key role in the success or the organization’s processes. Designers cannot merely turn their backs and design the “ultimate” process, and fail to consider how the actors will be motivated. The lack of motivational energy has stifled well equipped and well trained soldiers when their country engages in warfare without public support (e.g. the Vietnam War, 1959-1975). Setting up coordinating mechanisms can, and should, be done while considering incentives.

7.3 Fee For Service v. HMO Model

The shift in the organizational model has affected physician incentives and motivation. The emergence of the HMO payment system was due largely to a national effort to reduce cost. Practitioners have expressed concern that the way the health care process is performed is different and the associated quality is compromised under the HMO scheme. Research and interviewing done in conjunction with this thesis contradicts that notion. In general, the quality of care, as measured by health outcomes, is comparable for HMO and non-HMO patients. This quality of care not only means clinically correct care, but includes timely access to care, the client’s valuations of inputs and outputs, client satisfaction, and production efficiency. No appreciable difference in actual care was cited from research or interviews. The typical patient response is lower under HMO schemes, but the quality of care considering the aspects mentioned above is good. Since the development and use of health care outcomes is in its infancy, accurate data for quality comparisons may be suspect. However, as a first approximation HMOs appear to be comparable to FFS service.

The major differences appear in the apportionment of discretionary care and administrative management. The FFS compensated physician may allow additional diagnostic testing to satisfy a patient’s desires; to indulge the patient’s wish for further testing even if it is physically unnecessary. This testing, it should be noted, does provide a psychological benefit that the HMO patient under similar conditions does not receive. Additionally, HMO case

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management efforts add a direct monitoring process that FFS patients, in general, do not receive. Patients are consulted and case managers provide advocacy that should be recognized as a contributing component of the managed care process.

HMOs can, and in some cases do, mandate practice guidelines by offering additional "bonus dollars" to practices that perform their recommended procedures. For example, at one of the medical practices, practitioners received bonus dollars if they performed mammograms on 80 percent or more of the eligible patients each year. Although this is a preventative step that attempts to aid early detection, it highlights a crossing point where payers are directing medical practices. The potential for abuse is high if the bonus dollar recommendations are not grounded in demonstrable health benefits. If they are driven by cost reduction efforts alone, physicians will have little incentive to deviate from the preordained routines and innovate.

Some of the most indisputable benefits and drawbacks of HMO financed medicine is presented in Table 7.1 for both the physician and the patient.

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient pays a set fee each month for all health care services. Physicians see a steady stream of payments each month.</td>
<td>HMO and PCP determine who the patient can see, not the patient.</td>
</tr>
<tr>
<td>System stresses prevention and early treatment to achieve better health at a lower cost.</td>
<td>More patient choice means more patient supported cost.</td>
</tr>
<tr>
<td>Care is focused on minimizing costs. Fewer tests are performed and patient stay in hospitals is shorter. No reward for overutilization and overcapacity.</td>
<td>Physician’s freedom is constrained on who he/she will treat and who he/she can use as a specialist.</td>
</tr>
<tr>
<td>Potential exists for automatic billing and approval.</td>
<td>HMOs may require adherence to practice guidelines</td>
</tr>
<tr>
<td>Patient has access to case management functions.</td>
<td>Less incentive to deviate from accepted norms and innovate.</td>
</tr>
</tbody>
</table>

Table 7.1 HMO Advantages and Disadvantages

Given the differences that are indicative to the managed care physician, managers must craft incentive systems carefully into their new organizations. To gain physicians’ support during discussions on acquisitions, health care financial managers should emphasize that alliances will
allow physicians to enhance their skills, learn new ones, and build on their strengths\textsuperscript{27}. That is for good reason. The compensation system in capitated medicine differs substantially from that of the fee-for-service system and can involve bonuses and incentives as well as base salaries. In a private practice setting, physicians keep 100 percent of their profits\textsuperscript{28}. As managers of physician employees, organizational leaders will not motivate their physicians solely on compensation derived from the traditional systems.

It seems clear that the process design and structure are determined to some extent by the incentive system in place. For example, often physicians that are compensated on a FFS basis will prescribe more adjunctive procedures than they will under an HMO scheme. This affects, most acutely, the rehabilitation of patients. A patient who might want six counseling visits is more likely to receive the care if she is seeing a FFS compensated physician than if she is seeing a HMO compensated physician. Therefore, by providing appropriate incentive schemes that are applicable to a majority of the physicians, behavior (and the process itself) can be altered in a desired way. Of course, the coordinating mechanism used to manage incentives can both positively and negatively impact the process.

### 7.4 Managing Incentives

With the knowledge of how managing incentives impacts the process, organizational designers should be forming physician groups, hospitals, and provider networks that move health care from hospital-centered care to patient-centered care. This starts by getting the PCP to truly manage the patient’s care. To accomplish this, the PCP’s compensation and professional stature must be raised. The incentive system must keep pace with the professional communities recognition of the vital role the PCP plays in managed care. But that means changing provider mental models. The Process Handbook, coupled with a modeling tool, might be used in a learning environment to change the mental models of the two key members

\textsuperscript{27} Randall B. Luster and Rik Baier, “Integrating Primary Care Practices Into Provider Networks”, \textit{Healthcare Financial Management}, June 1994. \textsuperscript{28}.

\textsuperscript{28} Randall B. Luster and Rik Baier, “Integrating Primary Care Practices Into Provider Networks”, \textit{Healthcare Financial Management}, June 1994. \textsuperscript{27}.
of the health care process: physicians and patients. Physicians need to understand how their role is changing and patients need to understand that they should be discriminating consumers of a competitive service.

There is some evidence that shifting treatment models have impacted the practice of medicine. According to a report by J.N. Ingle in the Hematology and Oncology Clinic of North America Journal, the medical community is recognizing the pronounced role the PCP will follow.

The primary cancer care physician's responsibility is particularly great for coordination of the multi-disciplinary approach and integration of medical oncology, radiation oncology, and surgical treatment modalities, however. In the case of metastatic breast cancer, an understanding of the importance of certain clinical factors (that is, hormonal receptors, performance score, disease-free interval, sites and extent of metastasis, and tempo of disease) is crucial to the development of the therapeutic plan in the individual patient.29

This seems to indicate that the physician mental model may be changing as more research uncovers the vital role played by multi-modal treatment managers (PCPs).

Let us further suggest that incentives serve as latent dependencies. As latent dependencies, process activities are not dependent on the immediate management of incentives in order to occur. A code of ethics, a Hippocratic Oath, a sense of responsibility may ensure that activities are performed with a modicum of quality. However, high quality performance depends on having an effective and rewarding incentive system. By focusing on this latent dependency, we can effect process improvements that include:

- Incentives that will get information to flow among PCP and specialists.
- Incentives that will encourage and reward preventative health care.
- Incentives that will make the physician's quality of life better.
- Incentives that will encourage innovation and cost-cutting measures in the long term.
- Incentives that will provide a seamless health care service.

This last incentive is very important. The benefit to the customer (the patient) cannot be overstated. Figure 7.1 illustrates what is possible.

![Diagram showing the seamless diagnosis system](image)

Figure 7.1 The Seamless Diagnosis System

This graphic indicates that by managing the sub-diagnosis process, a seamless diagnosis can be presented to the patient. Coordinating the two means the whole is greater than the sum of the two sub diagnoses. This organizational design, though, will require the management of latent incentive dependencies. PCPs and specialists will need to overcome the typical arms length business relationships and combine their efforts to survive in a more competitive and discriminating market.

If an organization is to survive, it must be inventing the way it will work tomorrow, today. Incentives must be in place to allow physicians to innovate. Clinical treatment trials and health care practice research continues to provide cutting edge learning. It is at the lowest levels, where the patient and the practitioner meet, that many insights are discovered. An environment that tolerates unorthodox procedures and unconventional treatment measures
stands the most to gain. Collaborative, bottom-up protocol development seems to be a desired approach because it enables thousands of practitioners to find new ways to “do it better” as opposed to a small section of the population. Additionally, it might focus more on demonstrable and field tested procedures. Three elements could impair this vital activity:

- HMOs are forcing physicians to perform only low cost, widely accepted practice guidelines and care processes.
- Information transfer among physicians and outcome measures to track efficacy are not as capable as needed for wide area dissemination.
- Incentives, like market-driven rewards, are not in place to compensate individual contributors (persons or practices) for innovations.

Sophisticated information systems may provide a solution to these barriers and provide a self sustaining incentive system for physicians who want to provide quality medical care, innovate, and still receive a fair day’s wage.
Chapter Eight. Negotiated Organizational Design

Negotiation in organizational design is a necessary part of the Process Handbook because the act of developing the process representation is a vital part of understanding the essence of the process. Managing this mapping and design effort is as important as selecting the process to use in the organization. Working with others and coming to agreement over the future organizational design will benefit from the use of negotiation tools like the Process Handbook.

8.1 Role of Negotiation in Organizational Design

Organizational designers rarely craft their organizations solely on their own experience and information. Instead, they rely on impetus of numerous colleagues, coworkers, customers, suppliers, and other agents in order to design an organization that meets the needs of as many key players as possible. Each actor who is included in the design process has his/her own view of what the organization should look like. Although some of these views are often conflicting during the design process, it is vital that they are heard and considered. The unique perspective of each design team member enriches the final outcome and must be preserved. This fact can easily be overshadowed by the inevitable conflict that often occurs when opposite opinions collide during design iterations. If untenable, it can reduce the design effort to only a few members (usually at the top of the organization) who will make a valiant, yet often ineffective, attempt to reengineer a process or an organizational form with less than complete or accurate information. In their need to simplify and streamline the process, they will unintentionally gut the opportunities for true organizational improvement.

Integrative bargaining techniques, used in conjunction with the design process, can assure a design solution that is palatable, and therefore more acceptable and able to be implemented, by virtually all of the affected stakeholders. By encouraging observation, analysis, and collective decision making, the Process Handbook could be used as a negotiation tool to provide a road map to understanding the process structure and help illuminate alternatives.
8.2 Elements of Negotiation

Integrative bargaining was first presented by Walton and McKersie in their 1965 book: *A Behavioral Theory of Labor Negotiations*. They define integrative bargaining as:

...the system of activities which is instrumental to the attainment of objectives which are not in fundamental conflict with those of the other party and which therefore can be integrated to some degree. Such objectives are said to define an area of common concern, a problem. Integrative potential exists when the nature of a problem permits solutions which benefit both parties, or at least when the gains of one party do not represent equal sacrifices by the other. This is closely related to what game theorists call the varying-sum game\(^{30}\).

Thus, integrative bargaining techniques can overcome the traditional economic zero-sum game most managers play during negotiations. Members of the same organization, or members of a network of organizations, will be faced with issues that are ripe for integrative bargaining because they usually have common goals. If it is true that all stakeholders will individually gain from the common profits of the group, then distributive bargaining (fixed sum, "slice the pie up among the stakeholders") activities shortchange the organization of potential collaborative benefits. Integrative bargaining forms the foundation for collaborative negotiations.

Nyhart has identified several aspects of joint projects that are enhanced through collaborative negotiation\(^{31}\). Under this type of negotiation, managers are able to:

- Enhance communication;
- Encourage collaboration;
- Understand each other's mental models; and
- Increase each other's perception of organizational structure and complexity of the problems encountered.


Communication could be enhanced by first allowing designers to use the Process Handbook to map two processes: their present processes and the future processes in which they would like their organization to engage. This mapping pulls mental models of the past and future from the mind to a medium that can be recorded and is visible to all who wish to view it. Once this is completed, participants could meet to share their ideas about the present state and future possibilities of the organization through a common lens. Collaboration is enhanced as members of the design team work with the Process Handbook. By virtue of their mapping efforts, designers will begin to understand each other’s mental models through discussion and explanation. As has been seen during the mapping of the health care delivery system around a single malady treatment, the processes represented are complex and the barriers to simple compromise becomes apparent to stakeholders quickly. This fact can elicit a certain level of tolerance for opposing views during the design process.

Organizational productivity could be increased by minimizing the time and space restrictions to present negotiation processes. Traditionally, those party to a negotiation process were forced to convene in the same meeting room at the same time in order to complete their agreements. Each iteration of the negotiation process requires the participants to come together for “across the table” negotiations. That works well when those involved in negotiation are neighbors to a plot of land who want to determine how best to cultivate the adjoining plot or even barterers in a town square trading their wares. Yet, the explosion of communication capability has allowed managers access to capital, labor, and resources on a global scale. Negotiation must keep pace and occur on a real-time basis with simultaneous inputs and iterations occurring regardless of where on the planet stakeholders reside. Dispersed negotiations, which can cross time and space boundaries, represent the most evolved consensus process. Support for distance negotiations is growing. Early initiatives sponsored by the federal government’s National Performance Review (NPR) are attempting to make use of a National Information Infrastructure (NII) to better facilitate and transform the
current notice and comment rulemaking process. Nyhart has suggested that the application of computer-based modeling tools could support integrative bargaining through improved measurement, interview and sampling techniques, the qualitative comparison of issues, and increased inter-agency communication. These activities require several provisions:

- a common language for communication;
- technologies that support communication across long distances and temporal displacement;
- a relationship of trust between interested parties; and
- support from senior management levels to invest in the process.

With this in technical capability in place, parties interested in the design process can then focus on the preserving elements of effective negotiation and mediation, to include:

- The need for diversity of views within and between interacting groups;
- All relevant information is communicated by positive reinforcement and revelation of true interests;
- Focus is on the group’s interests so groups can work on problem solving and integration of views; and
- The use of mechanisms to assist in the resolution of conflicts are bound to occur.

Advanced management approaches to group decision making are strengthening the notion that there is an alternative approach to the traditional “cut up the pie” rationale of negotiations. Managers now understand that during the process of negotiation, their objectives are not necessarily mutually exclusive and that, through integrative bargaining, they can achieve “win-win” solutions. Conditions necessary for successful integrative bargaining are outlined in Lewicki and Litterer’s, Negotiation. They point to several essential group environmental

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34 J.D. Nyhart and J.P. Martignone, Advancing the Processes of Alignment MIT Sloan School of Management, Jan 1995.
factors that should be present before integrative bargaining is attempted. These factors include:\(^{35}\):

- Being predisposed to find a mutually acceptable joint solution;
- The belief that the parties share a common goal and that they will attain this goal easier through a joint solution;
- Each party’s faith in his/her own problem-solving ability;
- The motivation and commitment to work together;
- Trust in each other’s personal commitment and honesty;
- Clear and accurate communication; and
- A belief in the validity of the other’s position.

If these factors are in place, then integrative bargaining can begin. There are three steps for integrative bargaining. These steps are categorized in three stages: problem definition, searching for alternative solutions, and evaluation and selecting the best alternative\(^{36}\).

*Identify Problem*

Careful problem identification is important before undergoing any problem solving activity, but it is particularly important during negotiations because interested parties often have differing views of the possible solutions that are based on their differing views of the problem. The first step is to identify and define the problem in a way that is mutually acceptable to both sides of the negotiation. That means that the facts of the problem and the method of presentation must be acceptable. The Process Handbook satisfies these requirements by providing a standard format for presenting processes that shows the organizational process structure.

*Generate Alternative Solutions*

Use nominal groups, surveys, and brainstorming to uncover all possible alternatives. Preliminary Process Handbook work, before negotiation begins, could give designers access to a myriad of organizational alternatives and parallel solutions to their needs.


Evaluate and Select Alternatives

Once the first two steps are complete, designers should narrow the range of solution options. Next they should evaluate the possible solutions on the basis of quality and acceptability. The Process Handbook could be an indispensable tool for this purpose. Before proceeding, however, designers should agree to the criteria of the decision making process early. The parties do not have to justify their personal preferences and should keep decisions tentative and conditional until all aspects of the final package proposal are put together.

8.3 Negotiating Through the Process Handbook

The Process Handbook can be used as a tool for integrative and displaced negotiations. It can be a tool for: 1) understanding the dependencies between activities; 2) providing a common framework for analysis; and 3) providing an electronic medium for long range collaboration between parties. Figure 8.1 shows a possible representation.

![Diagram](image)

**Figure 8.1** The Process Handbook as a collaborative negotiation tool.
An on-line process handbook could provide distance-separated designers with the opportunity to see clearly what the implications of the process they design really are. Other tools, including process simulation, can give a more three-dimensional understanding to the organizational framers. Different modes of operation could be examined long-distance, allowing each manager to view the benefits and detriments through a tradeoff matrix that they could design to shows the metrics that mattered most to them. In this way, interested parties could negotiate over organizational form and process structure and choose the best option for both parties.

8.4 Surgical Room of the Future

A possible answer to the shortcomings of traditional organizational design may be found in an initiative to help design new medical facilities for the United States Army. Under the ARPA Surgical Room of the Future Project, researchers at MIT, Harvard University, and Massachusetts General Hospital are trying to develop a multimodal virtual design environment that can be used to totally redesign the present surgical room layout. This new environment (called a Virtual Design Environment) will be used to design a new surgical room for both civilian and military use.

This initiative starts by addressing the need to develop a virtual world that will support innovative design. The virtual world will immerse both designers and users within the design world to be created during the actual design process. Designers will not consider merely their new design on the drafting table or on the screen of a CAD/CAM system, but will be able to navigate through a design environment as internal observers. Users and designers will have the opportunity to consider the surgical room design, such as lighting, equipment placement, and workflow patterns from a unique perspective: as an individual within the

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process. This has profound impacts on the way all design could be conducted in the future and how the Process Handbook could be developed.

Imagine a Process Handbook that meets the organizational designer much like the Virtual Design Environment described above. Designers could enter a world that depicts their process in a three dimensional, interactive form. As an explorer in this realm, the designer could observe the strengths and weaknesses of a current process and consider alternatives. The designer may also wish to build a new organizational process from scratch and could specify attributes, enter the environment, and observe the proposed process. The designer could then test the performance of the process by changing constraints, modifying the coordinating mechanisms for key dependencies, and gaining a richer understanding of the core processes.

The benefits to the design process are both obvious and subtle. The Process Handbook puts the issue on the table bringing foggy, unclear issues into a medium and level of analysis that facilitates substantive learning. As designers are compelled to undergo the process of design and the inherent negotiations that will automatically ensue, they will reap tangible process benefits. Co-designers leaving the process design drafting room will be in a better position to implement their blueprints as a result of their commitment to the negotiation process.
Chapter Nine. Systems Thinking and the Process Handbook

9.1 Systems Thinking

Systems thinking is a point of view that considers the interactions of actors and activities and their interconnected behavior. Once these multiple cause and effect relationships are understood, more powerful and far reaching decisions about their structure can be made. This is accomplished by influencing key leverage points that improve the behavior of the system, not merely the closest variable of interest. One of the basic premises of systemic thinking is that structure influences behavior. Peter Senge, in his now famous book The Fifth Discipline, explains\(^{39}\):

The term structure, as used here, does not mean the “logical structure” of a carefully developed argument or the reporting “structure” as shown by an organization chart. Rather, “systemic structure” is concerned with the key interrelationships that influence behavior over time. These are not interrelationships between people, but among key variables such as population, natural resources, and food production in a developing country; or engineers’ product ideas and technical and managerial know-how in a high-tech company.

Furthermore, systems thinking aims to shift the thinking process in two primary directions. First, systems thinking allows organizational designers to see interrelationships rather than simple cause and effect chains. Second, systems thinking helps the designer see the process of change rather than a single snapshot\(^{40}\).

Senge has described a set of laws for systems thinking that could be part of the organizational design process when managers are choosing among alternatives while working with the Process Handbook. These laws specify the behavior of systems and should guide the designer

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to consider the dynamic and long-term effects of the organization he/she is crafting. As the reader considers these laws, it should be noted that the Process Handbook does not specifically provide for their analysis. This is why systems thinking approaches to organizational design should be done in concert with the Process Handbook analysis. Some of the more applicable laws are:

*Today’s problems come from yesterday’s solutions.* Solutions that merely shift problems from one part of a system to another often go undetected because those who solved the first problem are different from those who inherit the new problem. This is particularly troublesome to the designer who considers only one of the organization’s processes at a time for redesign. Every process in an organization is, with the exception of very special cases, interrelated to all others. Changing one can, and usually does, change the performance of the others.

*The harder you push, the harder the system pushes back.* When well intentioned interventions call forth responses from the system that offset the benefits of the intervention, this is called “compensating feedback”. Process alteration should be considered in the continuum, not just activity-by-activity. This correlates to a dependency analysis that considers the interrelations among dependencies in a sub-process.

*Behavior grows better before it grows worse.* Short term benefits often reward short term decision making. However, often there exists inherent delays in the system. If short term policies are maintained long enough, they fail to continue to provide beneficial results, often causing more harm than good. Merits represented in the Process Handbook should represent long-term effects as well. It is easy to consider today’s problems and apply a Process Handbook analysis that moves the organization

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to another static state. What the designer needs to put in place is a dynamic process that needs only slight adjustments as future needs warrant instead of radical redesign.

*The easy way out usually leads back in.* This is the notion of pushing harder and harder on those elements that are easiest to affect instead of the more systematic, and often more difficult to change, causes. The Process Handbook does this well by considering the deep structural meaning of a process.

*The cure can be worse than the disease.* This is the case where a correction to a process is not only incorrect and short-sighted, but leads to repeating the same ineffective decision making in the future. The example usually cited is that of the alcoholic, who, suffering from depression, drinks more alcohol in attempt to improve his spirits. Unfortunately, the alcohol leads to further depression which leads to further drinking, and so on. Process design could have much the same effect (e.g. measures implemented to improve performance lower cost and adversely lower quality at the same time).

*Faster is slower.* There is no such thing as unlimited growth. Improvement and increased productivity cannot occur indefinitely and designers should be watchful for when their expectations outstrip their design capabilities. This might be a word of caution to the process designer who believes they have designed the “perfect” process. Process design should be an on-going process of iterative steps. System dynamics simulation can help identify when the organization’s performance needs a boost.

*Cause and effect are not closely related in time and space.* An insidious property of virtually all systems involving human activity is that there is a significant time delay between cause and effect. The sufferer of a heart-attack feels the effect of damage done months, perhaps, years earlier. Therefore, as designers approach the process of design, they should consider what has brought them there in the first place. Those undesirable reasons (or effects) may have been caused by activities that occurred out
of phase with their effects. Alterations to the process should be made with this in mind.

A major strength of systems thinking is the opportunity to affect learning. Through the use of dynamic modeling tools like system dynamics, designers can prototype the structural dynamics of their organizations along with their Handbook analysis. Now, let us look at the learning benefits.

9.2 Systemic Considerations and Learning

A learning organization is one that continually is searching for ways to re-invent the way it does work. True learning occurs not only when we absorb a new tidbit of information, but when we change the way we perceive and analyze the world around us (absorb a pearl of wisdom). This is known as double loop learning. Consider Figure 9.1:

![Diagram of Double Loop Learning]

Figure 9.1 Double Loop Learning

This well known relationship shows how an individual’s mental model of the world is affected by generative learning. This decision model can be entered at any point and shows the dynamic learning relationship. An actor makes a decision and takes action. Through
observation, the actor gets information on the adequacy of the action. He/she then interprets
the information and determines a corrective decision to achieve the desired outcome. This
feedback system of learning is fine if one wishes to approach and attain a performance
asymptote only. But, if one wishes to exceed mental boundaries, the actor must undertake
double loop learning. By this we mean transversing the loop that alters mental models
between the feedback of information and interpretation. When mental models are adjusted,
the baseline for comparison is adjusted and dynamic mental evolution is possible.

The Process Handbook provides an excellent opportunity for designers and managers to
undergo double loop learning. Much of the learning happens from the onset during the
mapping process. Process understanding is clarified and deepened and new ways to organize
the process are uncovered through comparison. Once coupled with a simulation tool like
system dynamics, the process can come to life. Designers can experiment in a dynamic
laboratory that allows them to not only view different process structures, but the behavior of
those structures under a wide variety of conditions.

Before systems thinking and system dynamics modeling can begin, the elements of feedback
must be uncovered in the process. Outcomes research seems to be the necessary feedback
that the health care delivery system is missing in order to determine whether process
improvements are working. Profit and loss are not the right indicators by themselves and their
place on the merit hierarchy should be subordinate to quality care elements. Although
outcomes is the necessary feedback for assessing the appropriateness and the efficacy of care,
it suffers from the problem of delays. It is hard to see the quality of a mastectomy if the
indications of a potential relapse do not manifest themselves for years.

For the future, system dynamics representations and models could be used to model the
Process Handbook’s process behavior. Consider the process structure in Figure 9.2.
In this structure, some earlier activity or group of activities triggers a decision at a choice point to use either the standard or innovative procedure for a given patient. The treatment then proceeds through the decomposed series of activities. As the designer is examining this activity, a system dynamics model is considering the implications of the decision on the organization's performance. The model can not only determine the effect of the decision, but also help show how the choices will unfold in the future given a set of assumptions. Figure 9.3 shows a very basic system dynamics model that hints at the possibilities.
Figure 9.3 System Dynamics model of innovative procedure adoption (using iThink software)
The two stocks represent the accumulated standard and the innovative procedures performed by the organization. These are influenced by several factors according to the Table 9.1:

<table>
<thead>
<tr>
<th>Factors That Increase Innovative Procedure Rate</th>
<th>Factors That Reduce Innovative Procedure Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increase in patients</td>
<td>Decrease in patients</td>
</tr>
<tr>
<td>Reduced liability risk</td>
<td>Increased liability risk</td>
</tr>
<tr>
<td>Increased MD's perception of treatment efficacy</td>
<td>Decreased MD's perception of treatment efficacy</td>
</tr>
<tr>
<td>Increased adoption attractiveness</td>
<td></td>
</tr>
<tr>
<td>Increased payer support $ for innovative measures</td>
<td></td>
</tr>
<tr>
<td>Increased equipment to support innovation</td>
<td></td>
</tr>
</tbody>
</table>

Table 9.1 Innovative procedure rate factors

Positive outcomes present the necessary feedback in the model, and the balance between the two type of activities can be converted into revenue, expenses, profit, quality, or any other metrics important to the designer. As the process is simulated, the designer can witness the effect of policy choices that influence the behavior of the system. By altering the coordination mechanisms, for example, one process chain might be more attractive to patients and physicians thereby altering the model behavior. This dynamic representation could give a new perspective to dependency analysis.
Chapter Ten. Implications of Research

10.1 Comparisons with Other Company Forms

Part of the Process Handbook analysis is to compare the present organizational form with other methods of delivering service to see if there are better ways of organizing processes. Two interesting organizational forms are VISA Corporation and the Internet Society.

10.1.1 VISA Model

The VISA organization is best described as a zero-profit, member-owned organization that helps coordinate the activities of member banks to offer a credit card service. The banks, as members and owners, make and live by the rules of the organization by carefully balancing competition and coordination. Individual banks are encouraged to compete, but the proliferation of the VISA card is important, too. Brand equity is developed and preserved through strict adherence to basic organizational rules, but banks may market the product any way they determine is most profitable. That means Citibank might issue a card with General Motors and gain a partnering relationship that benefits all three entities (not forgetting the VISA group as a whole). It also means that innovations are happening at the lowest level where sales campaigns can be “tried out” before they are adopted by the larger VISA community. This type of alliance is very flat organizationally and attempts to manage member activities with minimal protocols. Demonstrated results seem to determine where VISA is going next.

Medical delivery might be able to be structured the same way. Member entities (hospitals, medical practices, specialist groups) could network on a much larger scale to provide a wide range of services while spawning innovations more frequently. Instead of combating HMOs for a capitation rate, they would compete with other networks based on the quality of their

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42 From a presentation given by Emily Breuner, MIT Sloan School of Management.
care. Patients would be exposed to a larger specialist choice and could move freely among the groups. Individual members of the organization would have to meet performance standards set by the group, but could deliver service in any way they thought to be most effective. The group would promulgate new clinical and administrative innovations, allowing the entire organization to adopt them on a demonstrable basis. Traditional market mechanisms would help select the best networks for a discriminating patient population.

10.1.2 Internet Society Model

The Internet Society is an international professional organization established to encourage the evolution, standardization, and dissemination of techniques and technologies which allow diverse information systems to communicate. The society publishes newsletters, organizes conferences, and manages e-mail distribution lists to educate a worldwide community about the global network of computer networks known as the Internet which links more than four million users and one million computers. The society sponsors the Internet Architecture Board Force (IABF) and its Internet Engineering and Research Task Force (IETF), and maintains liaisons with other international organizations and standards bodies as part of its effort to assist in the evolution and growth of the critically important infrastructure represented by the Internet.

The Internet Engineering Task Force (IETF) is the protocol engineering and development arm of the Internet. The IETF is a large open international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. It is open to any interested individual. The IETF holds meetings three times a year. The actual technical work of the IETF is done in its working groups which are organized by topic into several areas (e.g., routing, network management, and security, etc.).

The organization of the IETF is around working groups. Small focused efforts are preferred to larger comprehensive ones. Preference for options for protocol development is limited.
The group's charter was created with a narrow focus with published goals and set provisions for milestones. Mailing lists are maintained and are one of the task forces chief resources. There is no formal voting and "rough consensus (and running code!)" are the preferential methods of decision making. Disputes are resolved by discussion and demonstration. Mailing lists and face-to-face meetings provide the principle vehicles for interaction. A majority of the communications and the decisions are made via e-mail (no "final" decisions are made at meetings).

Clinical guidelines could be developed using a similar procedure. Through demonstrated efficacy, treatments could be published and shown in teaching facilities based on their merit as assessed by the using population in the field. As procedures proved effective, adoption would progress. Adequate communication facilities would be needed to globally communicate outcomes and adoption rates. Compensation schemes could be developed based on adoption as well. For instance, one-time fees could be collected by the inventing organization when an institution adopts a practice. This would be supported by computerized tracking methods that would also track adoption and protocol proliferation. This information could help physicians choose the best practices as well as providing a compensation measurement system.

However, outcomes, and their measurement, are going to have to be further developed. They are the necessary elements that validate procedures that adopters will use to select a treatment plan.

10.2 Inventing Organizational Forms

By using the Process Handbook, the organizational designer should be able to invent new organizational forms to meet his/her needs.

10.2.1 Elements Managers Should be Considering

Managers cannot be content with looking inward on their organizations for insights. They must compare their operations with other organizations and other organizational environments
like VISA and the Internet Society. This may be a very novel exercise for most managers, but if they are dedicated to its ends, it can provide important discoveries about their operational abilities.

Consider the example of the F-15 maintenance organization. There are several innovative activities during the maintenance of fighter aircraft that most managers would not immediately consider applicable to health care. First, all maintenance performed on USAF jets is recorded in a series of automated and manual records. These records have several properties that would be ideal for medical records:

- **Consistency.** All records, whether on C-141 cargo aircraft, T-38 training jets, or F-16 fighter aircraft, have the same record elements that are completed and maintained in the same fashion. Each set of “aircraft forms” are managed the same way. This means that an aircraft maintainer can literally open the aircraft forms for any aircraft, in any part of the world, and determine the status of the equipment immediately.

- **Accessibility.** Records stay with the aircraft at all times. This means that any technician or officer, of any specialty or organization, can access the aircraft’s status.

- **Understandable by all.** USAF maintainers receive the same training for interpreting, completing, and revising aircraft forms. This helps maintainers diagnose and repair aircraft discrepancies across disciplines.

Second, many aircraft are self diagnosing. Special instrumentation allows maintainers to plug into the aircraft and gain vital performance information before repairs are attempted. In-home patient monitoring is an analogous process. Patients could be scanned from their homes forwarding such information as the nature of the complaint, vital signs, video, and even blood sample results to their PCP for diagnosis.
Third, aircraft maintenance teams are good at coordinating treatment. Individuals assigned to the care of the aircraft, called dedicated crew chiefs (DCC), monitor the aircraft’s health and manage all aspects of care. As specialists perform work on the jet, the DCC assists and provides continuity to the maintenance process. Mutual learning occurs between the specialist and the DCC because the specialist teaches the DCC about his/her particular area of competence and the DCC teaches the specialists about the “quirks” of his/her particular aircraft. Both bring a new perspective to the other’s repair process which enhances the effort. A closer relationship between PCPs and their specialists might have the same effect. PCPs could also assist specialists (and vice versa) to dedicate care to each patient.

As has been mentioned earlier, a major consideration for health care professionals should be the management of information. Information could easily be more accessible, uniform, and reliable with greater collaboration and network formation. One innovation that could be started immediately is a patient “tickler” system that shoulders some of the management of the patient with the PCP. This system could be an expert system that could monitor diagnosing activities, recommendations, current medical trends, scheduling, and billing to free the PCP to monitor more clinical activities (core process activities) and less administrative activities (coordinating activities).

There are concrete examples highlighting where the management of information improves performance. For example, a careplan card has been developed which blends the traditional nurse’s Kardex with an organizational care plan to create a dynamic, indispensable tool which coordinates both medical and nursing care and is responsive to the rapid changes seen in a critical care setting43. This system synthesizes information in a way that reduces redundancy and speeds work.

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The diagnosis process is essentially an information foraging exercise where the practitioner must attempt to uncover salient points of information about the patient while up against time and resource barriers. In order to obtain optimal treatment results, close cooperation between the different disciplines involved in multimodality treatment of breast cancer is absolutely necessary. Open communication between the radiotherapist, surgeon, pathologist, and physicist forms a chain, as strong as its weakest link. In a survey on combined modality treatment, researchers found that an appreciable minority of women with resectable local regionally advanced breast cancer may have prolonged disease-free survivals following combined modality therapy.

The health care industry, in general, may want to consider divorcing the relationship between employment and health care coverage. Wages and salaries could be raised to reflect the savings gained from not having to pay into an HMO or insurance scheme and patients could group according to medical and economic competitive factors. This would finally move medical care away from the labor insurance entitlement position it has held for years.

10.2.2 New Ideas

Virtual Medicine/Hospitals/Physicians (On-line diagnosing)

Most medical experts agree that better medical treatment can be delivered if the patient is more informed about her own health. This is true for several reasons. First, by educating the patient on her malady, the medical treatment that is performed by the patient is more effective. The patient will provide more information and implement more of what providers recommend when she is aware of the consequences. Second, through education, more of the treatment can be handled by the patient since the patient will be more aware of treatment procedures and problematic symptoms. This can potentially lower the overall treatment costs by transferring some of the treatment to the relatively low cost in-home environment. Finally, patients should

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be part of the care they receive from an economic perspective. An educated patient who
shares the decision on a cost and health basis will become an active partner in the treatment
process.

One way to improve patient participation in the information age is by encouraging on-line
education and diagnosing. There currently exists tools to invent a Virtual Hospital. This
concept could advance the exchange of information in a similar way that aircraft diagnosing is
being done by bringing more complete information to the physician earlier in the process.
This advanced system would require that the medical profession relegate some of its control
on diagnosing procedures. The cultural shift of considering the patient a part of the diagnosis
process would be challenging to overcome, but would go a long way to extending the
physician's treatment reach.

One example of a virtual hospital is a project supported by the University of Iowa that
provides patient and physician information on the Internet. Finding the Home Page called The
Virtual Hospital, the hospital description is as follows:

The Virtual Hospital (VH) is a continuously updated medical multimedia
database stored on computers and accessed through high speed networks 24
hours a day. The VH will provide invaluable patient care support and distance
learning to practicing physicians.

The VH information may be used to answer patient care questions, thus
putting the latest medical information at physicians' fingertips. This same
information may be used for Continuing Medical Education (CME); delivering
CME to physicians' offices and homes at a convenient time and location. The
VH is built on pre-existing computer and communication standards and uses
the World Wide Web (WWW) software technology to store, organize, and
distribute our multimedia textbooks (MMTBs) contained within it. We define
a MMTB to be a program that patterns its user interface after a printed
textbook. Our MMTBs incorporate functions such as free text searching, the
ability to play video and audio clips, and to display an unlimited number of
high-resolution images.

At present, the service merely provides information for both patients and physicians. This is a
good first step for those patients who have access to the Internet. Those who would
otherwise not call their physician out of fear might be more willing to review information in the privacy of their own home. This technology could be enhanced with the help of telemedicine. Telemedicine promises benefits for crossing the geographic boundary. As the technology proliferates, patients could be diagnosed from home, with inputs from many specialists at once. The discovery time will be shortened since home care and telemedicine speed detection through faster communication and allow patients to interact in proportion to their emotional comfort.

**Practice Model for Organizational Design**

As discussed earlier, linking the Process Handbook with system dynamics modeling could provide a learning tool for the organizational designer. The ARPA sponsored MIT/Massachusetts General Hospital Surgical Room of the Future project provides an example of what a design laboratory could look like. By designing the Process Handbook to function in a virtual world that enables designers to “play” with new ideas, dramatic learning is possible. And this doesn’t have to happen to the designers by themselves. In many ways, the building of the Boeing B-777 proved that virtual collaboration can be effective. Designers of the airframe structures to the engines to the rivets, working in hundreds of different organizations and different locations, designed the aircraft virtually. Computer supported CAD/CAM software tied the entire aircraft together from initial inception to first prototype. Integrated process design teams could work in the same way to integrate their process designs into a complete organizational process.

**Bottom-up CarePlan/Protocol Development**

It has been shown in many instances that top-down management suffers from insufficient information about the true nature and implications of the processes it is trying to control. All too often, a policy is implemented from oversight personnel in an attempt to improve existing organizational performance, only to fail from their lack of understanding and support from their subordinates. Problems arise from the insufficient compliance that arises from a lack of personal incentive and managerial control. One way to fix that problem is to have protocols developed at the physician/patient level.
This is a more effective way to develop any protocol methodology because the actors that have to actually use the process are inventing it. It is in their best interest to design a system that works for them. Providing the actors with information about the long term effects of their protocol developments will help them make more intelligent decisions. As in the Internet Society, small, consensus oriented groups who evaluate protocols based on demonstrable performance is the right approach.

**Negotiation Schemes Based on Collaborative Development**

An important aspect of organizational innovation and invention is to consider what happens when a process crosses organizational boundaries. For instance, the automobile manufacturer who make the tires in-house faces very different economic and organizational challenges than the automobile manufacturer who outsources tires across its boundaries. Of particular interest are the coordination mechanisms, the incentive structure, and the information processes that are needed to enable this type of transaction.

The process handbook could assist the cross boundary analysis by providing a common language for analysis and enabling collaborative negotiation during process design. The possibility of a telecommunications interface would allow geographically dispersed design among many parties of the value chain.
The process of organizational design is more art than science. Designers fly by the seat of their pants making corrections and adjustments from data that is often insufficient and measured against goals that are oriented for the short term. They need tools that will catapult them into the future and allow their design efforts to consider the future implications of their decisions. This thesis has considered the delivery of health care and how the Process Handbook might be used to improve patient health. To be truly effective, the Process Handbook must adopt simulation attributes, be combined with systems thinking analysis, and used as a negotiation tool to manage the organizational change process.

11.1 Breast Cancer Treatment Conclusions

Above all else, health care should treat patients and make humans healthier. The Process Handbook illuminates the many organizational barriers that inhibit actors from achieving their goals. Barriers exist between the PCP and the patient, between the PCP and ancillary providers, between the ancillary providers and the patient, and between all actors and the physical and informational resources. These barriers can be thought of as the insufficient availability and misaligned use of resources, time, and information. By identifying and attacking these barriers with the Process Handbook analysis, designers can reap profound benefits.

After mapping the process and analyzing the specializations, dependencies, and coordinating mechanisms, several conclusions are clear.

*Early Detection*

Early detection is crucial to minimizing the effects of breast cancer. Unfortunately, there are no preventative measures that the medical community can use to prevent breast cancer. Early detection can mitigate the damaging effects cancer causes and efforts to improve patient
health start there. A crucial insight is that a large part of the ability to detect a cancerous lump rests with the patient. Active patient education efforts and tools like on-line diagnosing can help the patient get the care she needs. By moving the diagnosing tools closer to the patient, the detection cycle can be shortened. The effort to outfit patients with information access and service should also be complemented with behavioral change efforts that will enable both the patient and the medical community to accept the shift in responsibilities and roles.

**Seamless Medical Delivery Organization**

Ways to better link practitioners to patients and provide patients with a seamless practitioner must be explored. By improving the nature, availability, and use of information, care providers can eliminate problems associated with fragmentation like over-medication, insufficient information resources (patient records, x-ray films, etceteras), misdiagnosis, and insufficient patient case management. When the knowledge of six physicians can be cross pollinated, more dynamic and richer insights about the patient’s condition can be discovered.

The most promising integration model is the concept of a group practice without walls presented earlier. This practice structure would decentralize physician operations while economies of scale would enable more efficient administration. Independent practitioners would have access to the benefits of a group practice while retaining considerable autonomy in day-to-day affairs\(^{46}\). This is crucial because the individual autonomy would assist individual physicians determine where to move health care on a case-by-case basis. This is similar to flocking theory that attempts to explain how the individual movements and flight paths of a birds can appear to move the flock in a purposeful, directed way. The movement of the medical community may be able to move in much the same way if the right organization is invented to support it.

The seamless organization directly benefits the patient. Figure 11.1 shows the a way to consider the diagnosis process from a seamless perspective.

Here, the PCP's initial diagnosis is modified as the patient moves through the process. In order to make this happen, the same information must be available to all actors who come in contact with the patient. That is usually attempted through informal communication or formal manual measures. The wide-spread application of information technology would make an immediate improvement. The process must be specifically designed to accommodate additions to the diagnosis and facilitate interpretation not only by the providers downstream, but allow the upstream providers an opportunity to modify their original assessments and add new ones. This could be the virtual seamless diagnosis. As the patients interface with these providers, their diagnosis should come alive. Each provider, having established personal relationships and trust with the other members of the provider network, can access the diagnosis model as the patient is progressing through the treatment process.

Another way to form the seamless organization is by forming alliances across organizational boundaries. Key communication points within the process are the appropriate target points for interface. Alliances supported by information technology will help the provider network
provide "one-stop shopping" for the patient and anyone else who wishes to query the system. This can be done by making all personnel aware of all aspects of the patient's condition (increase scope of information dissemination - reduce shared resource constraint) or making the data easy to interpret by all actors (usability improved). This may help stem the alienation some patients feel at the hands of a cost-conscious medical environment and bring back the "family doctor" in the form of a well coordinated medical delivery team.

*Treatment speed*

Treatment speed provides the second leg of the breast cancer care process. The patient's virtual diagnosis can now be transformed into a virtual treatment plan that is updated as the patient receives care. Some procedure choices are terminated as care continues and new possibilities are presented as the patient's condition changes. Coupled with global reporting and analysis systems, the virtual treatment plan would keep local providers up to date with the very latest methods.

*Patient education*

Getting medical service has always been somewhat of a mystery for most people. Medical professionals have shouldered the brunt of the responsibility for properly diagnosing and treating patients. This rationale for preserving this environment may be in order to comfort the patient during a time of stressful decisions, protect the patient from an onslaught of foreign information, or just allow the medical community to maintain control of the delivery of health care. These reasons are short-sighted. They prevent the gains that can be achieved from a well informed patient. There needs to be a radical shift in the education of the average patient. This is not to advocate training and conferring an MD for every patient who enters the office. It does mean making the patient more a part of the treatment plan.

The new patient should purchase medical care just like he/she purchases any other service. The medical community can help spearhead that effort by diffusing information and managing patient expectations. Patients have to start understanding that in a society with scarce resources, medical care is not an intrinsic entitlement. Our national society can set policy to
muster sufficient resources to provide every citizen enough care to satisfy minimum health care needs. However, additional funds and, more importantly, stronger incentive mechanisms will be needed to drive costs down, make current delivery systems more efficient, and provide an environment for innovation.

Empowering the patient with more information can have several effects, including:

- Earlier diagnosis;
- More appropriate treatment recommendations;
- Reduced risk of duplicate treatment;
- Better use of funds; and
- Less liability from malpractice suits.

Patients should be purchasing health care like they purchase any other service; from an educated and discriminating position. They must be aware of the costs of health care so that they can make informed decisions about provider, insurance, and HMO choice.

Possible implications of the new organizational structure for health care delivery include:

- Shifting where treatment occurs;
- Shifting when treatment occurs;
- Shifting who does what element of the treatment; and
- Changing treatment types.

A more adequate measure of patient costs must also be designed. Since each patient is different and requires different care, a way to reduce costs is to develop a system that provides clearer determinants of cost drivers. These drivers could then be combined to form a complete careplan for the patient. This careplan should be the actual service that the medical community is providing. By designing a process representation scheme that can track activities and the costs associated with those activities, we can better assess patient charges and set capitation rates. More importantly, efforts to improve dependency control and coordination can be focused on those activities that are the most costly to the process. It should be noted that the “most costly” is a relative term. A process can be economically
cheap, but may require expensive approval coordination mechanisms to preserve life and/or limb.

11.2 Process Handbook Conclusions

The Process Handbook is first and foremost a modeling tool to facilitate understanding and design. As a modeling tool, it must be limited in its process representation because attempting to represent all process elements would result in a model that was too costly to use and as complicated to understand as the real life process. Therefore, there is an inherent limit to what can and what should be shown in the Process Handbook. Scoping should be a concurrent process in the mapping exercise and should be disciplined by considering who will be using the Handbook. The process should show those elements that are important to individuals who will have the responsibility and authority to make process changes.

The Process Handbook tradeoff matrix allows the organizational designer to consider two or more process alternatives and weigh each via a matrix of performance indicators. It is meaningful to note that the tradeoff matrix preserves the designers role as ultimate process crafter. It does not, nor should not, attempt to provide a solution for what the designer is attempting to accomplish. Rather, it should present alternatives and the consequences of the designer’s choices to help him/her select an appropriate option. This tradeoff approach is an excellent way to present information, but the matrices can be improved in two ways. First they can become both quantitatively as well as qualitatively descriptive. Presently, only textual descriptions are used that measure the tradeoffs in terms of low to high importance. By adding in the quantitative capacity for the matrices, computational analysis is possible and comparisons are facilitated. Second, designers should be able to consider the human side of their management decisions in the matrix. Just as profit and loss, inventory turnover, and throughput might be very valid elements of the matrix, the “softer” variables should also be represented. Variables like span of control, worker environment, job satisfaction are possible entries into a new line of the tradeoff matrix as shown in Figure 11.2.
Virtual Handbook

A further refinement of the Process Handbook may be in the form of a virtual handbook. Technology that exists today may make this idea possible by merging the Process Handbook premises with a virtual environment that immerses the designer within the process flow. In effect, the analogy is that of a swimmer who has taken great pains to navigate his/her way to find a river in which to swim. He/she has not only found the river, but has seen it, described it, and has learned much about its properties. However, the swimmer has yet to get into the water. Until now.

In the Virtual Process Handbook, designers enter the process design world and are part of the process. They might take on the role of a virtual patient with a predetermined set of indications and them “ride along” through the process grading the experience based on metrics that matter to that designer. The designer could then try the process again only this time from the vantage point of the PCP. This new vantage point would provide additional data about the process attributes. By viewing the process from many different perspectives, the designer builds a cross-referenced mental model of the process that is much more robust than a single actor analysis.

Another advantage to the Virtual Process Handbook is the ability to test different process structures repeatedly without actually having to build these organizations. The designer, after
navigation through the process, can impose tighter or more relaxed constraints and observe the results quickly and inexpensively.

Virtual Process
Since the delivery of health care requires so much customization on a patient-by-patient basis, it might not be enough for organizational designers to redesign the organization only when performance metrics suffer. Instead, other triggers could be used to modify the process each time a patient enters the care process. Patient characteristics such as age, acuity, co-morbidity, and behavior could be inputted into the Process Handbook (or a sister spin-off) that would immediately generate a recommended treatment path. Coordinating mechanisms would also be adjusted based on the nature of the care required, the resources available, and the actors involved.

The Process Handbook provides the organizational designers with a valuable tool for inventing the organizations of the 21st century. Coupled with simulation tools and using the handbook to facilitate change producing negotiations will ensure organizational transformations are dramatic and long-lasting.
APPENDIX A

PROCESS MAP - ENTIRE PROCESS, TOP LEVEL DEPENDENCIES
APPENDIX B

PROCESS ACTIVITY MATRIX
<table>
<thead>
<tr>
<th>Activity</th>
<th>Actor</th>
<th>Goal</th>
<th>Artifacts</th>
<th>Dependencies</th>
<th>Type of Primary Dependency</th>
<th>Coordinating Mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collect Payment</td>
<td>Billing representative, Providers</td>
<td>Compensation</td>
<td>Money</td>
<td>Processing contracts, patients, billing forms</td>
<td>Shared resource, prerequisite constraints</td>
<td>Notification, sequencing, tracking, contracts, reports</td>
</tr>
<tr>
<td>Bill Payment Provider</td>
<td>Providers, institution</td>
<td>Compensation</td>
<td>Bills, reports</td>
<td>Entries on encounter forms</td>
<td>Prerequisite constraints</td>
<td>Notification, sequencing, tracking, contracts, reports</td>
</tr>
<tr>
<td>Receive Payment</td>
<td>Providers, Institution</td>
<td>Bill settlement</td>
<td>Money</td>
<td>Payment by bill recipient, matching permission to payment</td>
<td>Shared resource, prerequisite constraints</td>
<td>Notification, sequencing, tracking, contracts, reports</td>
</tr>
<tr>
<td>Perform Case Management</td>
<td>HCHP Case Manager</td>
<td>Coordination, tracking, control</td>
<td>Report, chart, knowledge</td>
<td>Access to adequate information, cooperation with physicians</td>
<td>Prerequisite constraints, usability</td>
<td>Non-creation, sequencing, tracking, contracts, reports</td>
</tr>
<tr>
<td>Request Permission to Provide Service</td>
<td>Member Services, Providers, Patients</td>
<td>Promise of compensation</td>
<td>Documentation</td>
<td>Knowledge of network</td>
<td></td>
<td>Phone, contract, fax</td>
</tr>
<tr>
<td>Receive Permission</td>
<td>Providers, MC contact</td>
<td>Permission</td>
<td>Verbal &quot;OK&quot;, Forms</td>
<td>Approval from HCHP, Patient situation, national standards</td>
<td></td>
<td>Phone, computer, fax, contract</td>
</tr>
<tr>
<td>Provide Early Detection</td>
<td>PCP, Nurse</td>
<td>Disease prevention</td>
<td>Health</td>
<td>Patient Education, cooperation, PCP availability</td>
<td>Shared resource</td>
<td>Scheduling, ACS relations, documentation</td>
</tr>
<tr>
<td>Provide Patient Education</td>
<td></td>
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<tr>
<td>Educate Non-Active Patients</td>
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<tr>
<td>Patient Requests Information</td>
<td>Patient</td>
<td>Education, clarification</td>
<td>Information, comfort</td>
<td>Information availability</td>
<td>Shared resource</td>
<td>Phone, information centers, ACS</td>
</tr>
<tr>
<td>Gather Information</td>
<td>Nurse, PCP, Specialist</td>
<td>Keep up to date information available</td>
<td>Documentation, information</td>
<td>Information availability</td>
<td>Shared resource</td>
<td>ACS, inventory control</td>
</tr>
<tr>
<td>Distribute Information</td>
<td>Nurse, PCP, Specialist</td>
<td>Provide Patient with information</td>
<td>Documentation, verbal information</td>
<td>Patient interest, Shared resource availability</td>
<td>Producer/consumer, Shared resource</td>
<td>ACS, scheduling, phone, mail</td>
</tr>
<tr>
<td>Educate Active Patients</td>
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<tr>
<td>Provide Literature on Request</td>
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<tr>
<td>Patient Requests Information</td>
<td>Patient</td>
<td>Education, clarification</td>
<td>Information, comfort</td>
<td>Information availability</td>
<td>Shared resource</td>
<td>Phone, information centers, ACS</td>
</tr>
<tr>
<td>Gather Information</td>
<td>Nurse, PCP, Specialist</td>
<td>Keep up to date information available</td>
<td>Documentation, information</td>
<td>Information availability</td>
<td>Shared resource</td>
<td>ACS, inventory control</td>
</tr>
<tr>
<td>Distribute Information</td>
<td>Nurse, PCP, Specialist</td>
<td>Provide Patient with information</td>
<td>Documentation, verbal information</td>
<td>Patient interest, Shared resource availability</td>
<td>Producer/consumer, Shared resource</td>
<td>ACS, scheduling, phone, mail</td>
</tr>
<tr>
<td>Activity</td>
<td>Actor</td>
<td>Goal</td>
<td>Artifacts</td>
<td>Dependencies</td>
<td>Type of Primary Dependency</td>
<td>Coordinating Mechanisms</td>
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<tr>
<td>Teach Patient SBE</td>
<td>Primary Care Physician</td>
<td></td>
<td></td>
<td>Access to provider</td>
<td>Shared resource</td>
<td>Phone, scheduling</td>
</tr>
<tr>
<td>Patient Requests Information</td>
<td>Patient provider</td>
<td>Education</td>
<td>Open request</td>
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<tr>
<td>Teach SBE</td>
<td>Primary Care Physician</td>
<td>Educate Patient</td>
<td>Knowledge, documentation</td>
<td>Facilities, time, cooperation</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, phone</td>
</tr>
<tr>
<td>Answer Questions</td>
<td>Primary Care Physician</td>
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<tr>
<td>Patient Requests Information</td>
<td>Patient</td>
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<tr>
<td>Provide Information</td>
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<tr>
<td>Monitor Patient Health</td>
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<tr>
<td>Perform Initial Physical</td>
<td>Primary Care Physician</td>
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<tr>
<td>Establish Baseline</td>
<td>Primary Care Physician</td>
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<tr>
<td>Perform Regular Mammograms</td>
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<tr>
<td>Recommend Mammogram</td>
<td>PCP, Specialist, ACS</td>
<td>Encourage preventative medicine</td>
<td>Documentation, medical order</td>
<td>Access, chart, Patient history, current national guidelines</td>
<td>Shared resource</td>
<td>Scheduling, phone, mail</td>
</tr>
<tr>
<td>Perform Mammogram</td>
<td>Primary Care Physician, Radiologist</td>
<td>Obtain Image</td>
<td>Image</td>
<td>Facility, Patient and provider availability, time</td>
<td>Shared resource</td>
<td>Scheduling, facilities management</td>
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<tr>
<td>Assess Patient Mammography Rate</td>
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<tr>
<td>Track Patient Records</td>
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<tr>
<td>Track Baselines</td>
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<tr>
<td>Perform Quality Audits</td>
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<tr>
<td>Perform HMO/Insurer Audit</td>
<td>HMO/Insurer personnel</td>
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<tr>
<td>Compare Practices to Accepted Norms</td>
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<tr>
<td>Perform PCP Audit</td>
<td>Head Physician</td>
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</tr>
<tr>
<td>Perform Annual Audit</td>
<td>Head Physician</td>
<td>Trend determination, quality assurance, cost control</td>
<td>Documentation</td>
<td>Access to charts, accuracy and completeness of information</td>
<td>Shared resource, Producer/consumer</td>
<td></td>
</tr>
<tr>
<td>Gather Data from Patient Records</td>
<td>Assistant, Provider</td>
<td>Data collection</td>
<td>Report, files, data</td>
<td>Access to and availability of information, time</td>
<td>Shared resource, Producer/consumer</td>
<td></td>
</tr>
<tr>
<td>Review Records</td>
<td>Head Physician</td>
<td>Determine quality and quantity control issues and trends</td>
<td>Documentation, knowledge</td>
<td>Time, access to information</td>
<td>Shared resource, Producer/consumer</td>
<td></td>
</tr>
<tr>
<td>Determine and Take Corrective Actions</td>
<td>Head Physician</td>
<td>Correct imperfections and create new options</td>
<td>Documentation, reports, reprimands and commendations</td>
<td>Time, access to information and violators</td>
<td>Shared resource, Producer/consumer</td>
<td>ACS, management</td>
</tr>
<tr>
<td>Perform Event Audit</td>
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<tr>
<td>Actor</td>
<td>Type of Primary Dependency</td>
<td>Goal</td>
<td>Artifacts</td>
<td>Type of Primar...</td>
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<tr>
<td>Head Physician</td>
<td>Shared resource, producer/consumer</td>
<td>Monitoring unusual cases</td>
<td>Knowledge, specific charts</td>
<td>Shared resource, producer/consumer</td>
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</tr>
<tr>
<td>Head Physician</td>
<td>Shared resource, producer/consumer</td>
<td>Quality assurance, regulation compliance</td>
<td>Reports, documentation</td>
<td>Shared resource, producer/consumer</td>
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<tr>
<td>Head Physician</td>
<td>Shared resource, producer/consumer</td>
<td>Health, Documentation, data</td>
<td>Documentation, knowledge</td>
<td>Shared resource, producer/consumer</td>
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</tr>
<tr>
<td>PCP, Specialist, Nurse</td>
<td>Shared resource, producer/consumer</td>
<td>Patients health, condition</td>
<td>Knowledge, documentation</td>
<td>Shared resource, producer/consumer</td>
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<tr>
<td>Physician, Providers</td>
<td>Shared resource, producer/consumer</td>
<td>Determining patient condition, needs</td>
<td>Educational access, knowledge</td>
<td>Shared resource, producer/consumer</td>
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<tr>
<td>Physician, Providers</td>
<td>Shared resource, producer/consumer</td>
<td>Understanding the patient</td>
<td>Educational access, knowledge</td>
<td>Shared resource, producer/consumer</td>
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<tr>
<td>Provider</td>
<td>Shared resource, producer/consumer</td>
<td>Determine medical history</td>
<td>Chart</td>
<td>Shared resource, producer/consumer</td>
<td></td>
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<tr>
<td>Provider</td>
<td>Shared resource, producer/consumer</td>
<td>Determine current condition</td>
<td>Documentation, knowledge</td>
<td>Shared resource, producer/consumer</td>
<td></td>
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<tr>
<td>Provider</td>
<td>Shared resource, producer/consumer</td>
<td>Document health, baseline opinion</td>
<td>Information, baseline opinion</td>
<td>Shared resource, producer/consumer</td>
<td></td>
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</tr>
<tr>
<td>Physician, Nurse</td>
<td>Shared resource, producer/consumer</td>
<td>Complete procedure, care</td>
<td>Documentation, care</td>
<td>Shared resource, producer/consumer</td>
<td></td>
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</tr>
<tr>
<td>Nurse, PCP</td>
<td>Shared resource, producer/consumer</td>
<td>Determine outcomes</td>
<td>Documentation</td>
<td>Shared resource, producer/consumer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provider</td>
<td>Shared resource, producer/consumer</td>
<td>Document all activity for future reference, the ability to share the information with other providers, and protect from the law</td>
<td>Chart</td>
<td>Shared resource, producer/consumer</td>
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</tr>
<tr>
<td>Activity</td>
<td>Actor</td>
<td>Goal</td>
<td>Artifacts</td>
<td>Dependencies</td>
<td>Type of Primary Dependency</td>
<td>Coordinating Mechanisms</td>
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</tr>
<tr>
<td>Examine Patient Condition</td>
<td>Provider</td>
<td>Determine physical condition</td>
<td>Knowledge, documentation</td>
<td>Access to Patient, facilities, authorization</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
</tr>
<tr>
<td>Prepare Patient</td>
<td>Nurse, PCP</td>
<td>Mentally and physically prepare Patient for intervention</td>
<td>Knowledge and less hysteresia</td>
<td>Facilities, Shared resource and Patient access</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
</tr>
<tr>
<td>Perform Procedure</td>
<td>Physician</td>
<td>Complete procedure, provide care</td>
<td>Documentation, altered Patient condition</td>
<td>Facilities, time, money, education, cooperation</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management, education system</td>
</tr>
<tr>
<td>Analyze Results</td>
<td>Provider</td>
<td>Determine outcomes</td>
<td>Documentation</td>
<td>Education, access to references, time</td>
<td>Shared resource, Producer/consumer</td>
<td></td>
</tr>
<tr>
<td>Add to Patient Record</td>
<td>Provider</td>
<td>Document all activity for future reference, the ability to share the information with other Providers, and protection from the law</td>
<td>Chart</td>
<td>Time, chart</td>
<td>Shared resource, Producer/consumer</td>
<td>Chart tracking</td>
</tr>
<tr>
<td>Order Diagnostic Test</td>
<td>PCP, Specialist</td>
<td>Order appropriate tests for diagnosis determination</td>
<td>Order forms, chart</td>
<td>Chart, time, knowledge</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical ordering system</td>
</tr>
<tr>
<td>Perform Diagnostic Tests</td>
<td>PCP, Specialist</td>
<td>Determine condition in order to establish next steps</td>
<td>Test results, information</td>
<td>Time, facilities access, equipment access</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management, education system</td>
</tr>
<tr>
<td>Prepare Patient</td>
<td>Nurse</td>
<td>Mentally and physically prepare Patient for intervention</td>
<td>Knowledge and less hysteresia</td>
<td>Facilities, Shared resource and Patient access</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
</tr>
<tr>
<td>Perform Procedure</td>
<td>Physician</td>
<td>Complete procedure, provide care</td>
<td>Documentation, altered Patient condition</td>
<td>Facilities, time, money, education, cooperation</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management, education system</td>
</tr>
<tr>
<td>Analyze Results</td>
<td>Physician</td>
<td>Determine outcomes</td>
<td>Documentation</td>
<td>Education, access to references, time</td>
<td>Shared resource, Producer/consumer</td>
<td></td>
</tr>
<tr>
<td>Add to Patient Record</td>
<td>Physician</td>
<td>Document all activity for future reference, the ability to share the information with other Providers, and protection from the law</td>
<td>Chart</td>
<td>Time, chart</td>
<td>Shared resource, Producer/consumer</td>
<td>Chart tracking</td>
</tr>
<tr>
<td>Consult References</td>
<td>Providers</td>
<td>Obtain outside information, additional opinions</td>
<td>Information, knowledge, documentation</td>
<td>Access to Shared resource (both written and colleagues), time</td>
<td>Shared resource, Producer/consumer</td>
<td>Libraries, relationships, national publications</td>
</tr>
<tr>
<td>Activity</td>
<td>Actor</td>
<td>Goal</td>
<td>Artifacts</td>
<td>Dependencies</td>
<td>Type of Primary Dependency</td>
<td>Coordinating Mechanisms</td>
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<tr>
<td>Get Shared resources</td>
<td>Providers</td>
<td>Obtain information, contact colleagues</td>
<td>Documentation, advice</td>
<td>Access to literature and experts</td>
<td>Shared resource, Producer/consumer</td>
<td>Professional relationships, publications</td>
</tr>
<tr>
<td>Read Shared resources</td>
<td>Providers</td>
<td>Absorb and analyze information</td>
<td>Knowledge</td>
<td>Time, understanding</td>
<td>Shared resource, Producer/consumer</td>
<td>Education system</td>
</tr>
<tr>
<td>Make Judgment</td>
<td>Providers</td>
<td>Apply knowledge to situation and determine opinion</td>
<td>Documentation</td>
<td>Time, understanding, analytic ability</td>
<td>Shared resource, Producer/consumer</td>
<td>Education and professional experiences</td>
</tr>
<tr>
<td>Consult Specialists</td>
<td>Providers</td>
<td>Obtain expertise</td>
<td>Knowledge, documentation, confirmation/controversy</td>
<td>Access to Shared resources</td>
<td>Shared resource, Producer/consumer</td>
<td>Professional relationships</td>
</tr>
<tr>
<td>Get Shared resources</td>
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<tr>
<td>Talk to Shared resources</td>
<td>Providers</td>
<td>Obtain alternative opinions and expertise</td>
<td>Documentation</td>
<td>Access to Shared resources, common language and understanding</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
</tr>
<tr>
<td>Make Judgment</td>
<td></td>
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</tr>
<tr>
<td>Confirm Patient Condition and Record</td>
<td>Providers</td>
<td>Establish treatment base, make information available to others</td>
<td>Chart</td>
<td>Professional expertise, access</td>
<td>Shared resource, Producer/consumer</td>
<td>Education system, scheduling, record tracking</td>
</tr>
<tr>
<td>Perform Triage Nurse Assessment</td>
<td>Triage Nurse</td>
<td>Get Patient medical treatment if needed</td>
<td>telephone, Patient records, consultation log</td>
<td>Professional guidelines, access to information</td>
<td>Shared resource, Producer/consumer</td>
<td>AMC triage system, national healthcare guidelines</td>
</tr>
<tr>
<td>Question Patient</td>
<td>Triage Nurse</td>
<td>Find out why Patient is calling</td>
<td>telephone</td>
<td>Patient communication</td>
<td>Usability</td>
<td>Triage system, telephone</td>
</tr>
<tr>
<td>Review Chart</td>
<td>Triage Nurse</td>
<td>Learn Patient history</td>
<td>Patient records</td>
<td>Access to chart, education</td>
<td>Shared resource, usability</td>
<td>Record tracking system</td>
</tr>
<tr>
<td>Consult References</td>
<td>Triage Nurse</td>
<td>Select recommendation for Patient</td>
<td>automated/ manual records</td>
<td>Guideline understanding, authority</td>
<td>Usability</td>
<td>Education system</td>
</tr>
<tr>
<td>Consult Specialists</td>
<td>Triage Nurse, Specialists</td>
<td>Select recommendation for Patient</td>
<td>telephone</td>
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<tr>
<td>Confirm Patient Condition and Record</td>
<td>Triage Nurse</td>
<td>Identify ailment and record in charts</td>
<td>Patient record</td>
<td>Access to charts and Shared resources</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
</tr>
<tr>
<td>Refer Patient to PCP</td>
<td>Triage Nurse, Appointment Staff</td>
<td>Get Patient treated</td>
<td>telephone, consultation log</td>
<td>Understanding of system, authority</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
</tr>
<tr>
<td>Perform PCP Diagnosis</td>
<td>Primary Care Physician</td>
<td>Find lump or abnormality</td>
<td>encounter sheet</td>
<td>early diagnosis depends on Patient fear and level of self examination</td>
<td></td>
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</tr>
<tr>
<td>Review Chart</td>
<td>PCP</td>
<td>Determine Patient Condition, past and present</td>
<td>Chart</td>
<td>Accuracy of and access to information</td>
<td>Shared resource</td>
<td>Chart tracking and delivery system</td>
</tr>
<tr>
<td>Activity</td>
<td>Actor</td>
<td>Goal</td>
<td>Artifacts</td>
<td>Dependencies</td>
<td>Type of Primary Dependency</td>
<td>Coordinating Mechanisms</td>
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<tr>
<td>Question Patient</td>
<td>Primary Care Physician</td>
<td></td>
<td></td>
<td>Access to Patient, honesty and cooperation</td>
<td>Shared resource, Producer/consumer</td>
<td>Facilities management, phone, scheduling</td>
</tr>
<tr>
<td>Take History</td>
<td>Provider</td>
<td>Determine medical history</td>
<td>Chart</td>
<td>Access to Patient, facilities, authorization</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
</tr>
<tr>
<td>Examine Patient</td>
<td>Physician</td>
<td>Determine physical condition</td>
<td>Knowledge, documentation</td>
<td>Access to Patient, facilities and equipment</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, education</td>
</tr>
<tr>
<td>Establish Current Condition</td>
<td>PCP</td>
<td>Determine current medical and mental condition</td>
<td>Information, baseline opinion</td>
<td>Access to Patient, facilities and equipment</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, education</td>
</tr>
<tr>
<td>Perform Breast Examination</td>
<td>PCP</td>
<td>Determine current physical status (breast)</td>
<td>Results</td>
<td>Access to Patient, facilities</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical education, scheduling</td>
</tr>
<tr>
<td>Perform Diagnostic Tests</td>
<td>PCP</td>
<td></td>
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</tr>
<tr>
<td>Consult References (Literature, colleagues)</td>
<td>PCP</td>
<td>Gain additional professional insights</td>
<td>Information</td>
<td>Access to colleagues, literature</td>
<td>Shared resource, Producer/consumer</td>
<td>Professional relationships, Medical Publications</td>
</tr>
<tr>
<td>Consult Specialists</td>
<td>PCP</td>
<td>Seek advice from specific experts</td>
<td>Information</td>
<td>Access, common language and understanding</td>
<td>Shared resource, Producer/consumer</td>
<td>Professional relationships, medical networks</td>
</tr>
<tr>
<td>Confirm Patient Condition and Record</td>
<td>PCP</td>
<td>Identify ailment and record in charts</td>
<td>Patient record</td>
<td>Access to charts and Shared resources</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
</tr>
<tr>
<td>Determine Referral Option</td>
<td>PCP, Member Services</td>
<td>Examine treatment options and determine next course of action, and player responsible therefor</td>
<td>HCHP guidelines, professional guidelines</td>
<td>Access to guidelines, determination of Patient situation</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical education system, contract details</td>
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<tr>
<td>Diagnose Patient</td>
<td>Patient</td>
<td>Find lump or abnormality</td>
<td>none</td>
<td>Patient must perform BSE</td>
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<tr>
<td>Perform Radiology Diagnosis</td>
<td>Radiologist</td>
<td>Confirm lump is cancerous</td>
<td></td>
<td>Depends on PCP notification and description of malady, use preferred Specialist</td>
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</tr>
<tr>
<td>Review Chart</td>
<td>Radiologist</td>
<td>Determine Patient Condition, past and present</td>
<td>Chart</td>
<td>Accuracy of and access to information</td>
<td>Shared resource</td>
<td>Chart tracking and delivery system</td>
</tr>
<tr>
<td>Review Patient History</td>
<td>Radiologist</td>
<td>Review previous images, if any</td>
<td>Chart</td>
<td>Access to images</td>
<td>Shared resource, Producer/consumer</td>
<td>Chart and image tracking system</td>
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<td>Review Biopsy Results</td>
<td>Radiologist</td>
<td>Determine results of procedure</td>
<td>Result reporting</td>
<td>Results, education</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical Education, image tracking</td>
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<td>Type of Primary Dependency</td>
<td>Coordinating Mechanisms</td>
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<tr>
<td>Question Patient</td>
<td>Radiologist</td>
<td>Determine current condition and concerns</td>
<td>documentation and</td>
<td>contact with Patient, communication</td>
<td>Shared resource,</td>
<td>Scheduling</td>
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<td>understanding of situation</td>
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<td>Producer/consumer</td>
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<td>Examine Patient</td>
<td>Radiologist</td>
<td>Determine physical condition</td>
<td>Knowledge, documentation</td>
<td>Access to Patient, facilities, authorization</td>
<td>Shared resource,</td>
<td>Scheduling, facilities</td>
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<td>Producer/consumer</td>
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<td>Perform Mammography</td>
<td>Radiologist</td>
<td>Perform radiological procedure</td>
<td>Image</td>
<td>authority, education, facilities</td>
<td>Shared resource,</td>
<td>Scheduling, facilities</td>
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<td>Producer/consumer</td>
<td>management</td>
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<td>Compare to Baseline Mammographies</td>
<td>Radiologist</td>
<td>Compare new image to old</td>
<td>report</td>
<td>Access to previous images, common understanding</td>
<td>Shared resource,</td>
<td>Chart tracking and</td>
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<td>and interpretation</td>
<td>Producer/consumer</td>
<td>delivery</td>
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<td>Consult References</td>
<td>Radiologist</td>
<td>Gain additional professional insights</td>
<td>Information</td>
<td>Access to colleagues,</td>
<td>Shared resource,</td>
<td>Professional relationships,</td>
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<td>Producer/consumer</td>
<td>Medical Publications</td>
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<td>Consult Specialist (Surgeon)</td>
<td>Radiologist</td>
<td>Seek advise from specific experts</td>
<td>Information</td>
<td>Access, common language and understanding</td>
<td>Shared resource,</td>
<td>Professional relationships,</td>
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<td>Producer/consumer</td>
<td>medical networks</td>
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<td>Confirm Patient Condition and</td>
<td>Radiologist</td>
<td>Identify ailment and record in charts</td>
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<td>Access to charts and</td>
<td>Shared resource,</td>
<td>Medical system</td>
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<td>Shared resources</td>
<td>Producer/consumer</td>
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<td>Attend Tumor Board</td>
<td>Radiologist</td>
<td>Present Patient case, and participate in</td>
<td>Charts, recommendation for treatment</td>
<td>Access to charts,</td>
<td>Shared resource,</td>
<td>Scheduling</td>
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<td>treatment plan discussions and determinations</td>
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<td>cooperation between Specialists</td>
<td>Producer/consumer</td>
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<td>Perform Surgical Diagnosis</td>
<td>Surgeon</td>
<td>Confirm lump is cancerous</td>
<td></td>
<td>needs specific mapping of malady, use preferred</td>
<td>Simultaneity constraints,</td>
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<td>Shared resources</td>
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<td>Review Chart</td>
<td>Surgeon</td>
<td>Determine Patient condition</td>
<td>Patient records</td>
<td>Access to chart</td>
<td>Simultaneity constraints,</td>
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<td>Surgeon</td>
<td>Determine Patient condition</td>
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<td>Access to patient</td>
<td>Simultaneity constraints,</td>
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<td>Examine Patient</td>
<td>Surgeon</td>
<td>Determine Patient condition</td>
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<td>Access to patient</td>
<td>Simultaneity constraints,</td>
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<td>Shared resources</td>
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<tr>
<td>Perform Needle Biopsy</td>
<td>Surgeon</td>
<td>Remove lump for examination</td>
<td>Medical order</td>
<td>Access to patient, equipment, surgical room</td>
<td>Shared resource,</td>
<td>Scheduling</td>
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<td>Producer/consumer</td>
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<tr>
<th>Activity</th>
<th>Actor</th>
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<th>Artifacts</th>
<th>Dependencies</th>
<th>Type of Primary Dependency</th>
<th>Coordinating Mechanisms</th>
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<tr>
<td>Perform Frozen Section Biopsy</td>
<td>Surgeon</td>
<td>Remove lump for examination</td>
<td>Medical order</td>
<td>Access to patient, equipment, surgical room</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling</td>
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<td>Perform Paraffin Block Biopsy</td>
<td>Surgeon</td>
<td>Remove lump for examination</td>
<td>Medical order</td>
<td>Access to patient, equipment, surgical room</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling</td>
</tr>
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<td>Consult References</td>
<td>Surgeon</td>
<td>Check for information and clarification</td>
<td></td>
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<td>Confirm Patient Condition and Record</td>
<td>Surgeon</td>
<td>Document Diagnosis</td>
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<td>Perform Pathologist Diagnosis</td>
<td>Pathologist</td>
<td>Confirm lump is cancerous</td>
<td>Report</td>
<td>Lab tests, Patient in system, facilities</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical profession communication mechanisms</td>
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<tr>
<td>Review Lab Request</td>
<td>Pathologist</td>
<td>Determine what test is needed</td>
<td>Decision to proceed</td>
<td>Common language, order</td>
<td>Shared resource, Producer/consumer</td>
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<td>Test Specimen</td>
<td>Pathologist</td>
<td>Get information</td>
<td></td>
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<td>Test for Cancer</td>
<td>Pathologist</td>
<td>Determine if specimen is cancerous</td>
<td>Result/report</td>
<td>Medical Education, access to sample, facilities</td>
<td>Shared resource, Producer/consumer</td>
<td>Lab testing system</td>
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<td>Test for Hormone Sensitivity</td>
<td>Pathologist</td>
<td>Determine if hormone sensitivities exist</td>
<td>Result/report</td>
<td>Medical Education, access to sample, facilities</td>
<td>Shared resource, Producer/consumer</td>
<td>Lab testing system</td>
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<td>Check Against Norms</td>
<td>Pathologist</td>
<td>Check results against standards to determine condition</td>
<td>Result/report</td>
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<tr>
<td>Check Against National Norms</td>
<td>Pathologist</td>
<td>Compare results to national results</td>
<td>Report</td>
<td>Access to national data and results</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical profession information sharing</td>
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<tr>
<td>Check Against Patient Baseline</td>
<td>Pathologist</td>
<td>Compare results to previous results for same Patient</td>
<td>Report</td>
<td>Access to previous Patient results</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical education, charting system</td>
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<td>Confirm Sample Condition</td>
<td>Pathologist</td>
<td>Determine nature of sample</td>
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<tr>
<td>Pathologist Evaluation</td>
<td>Pathologist</td>
<td>Review findings and make judgment</td>
<td>Report</td>
<td>Medical education, access to results</td>
<td>Shared resource, Producer/consumer</td>
<td>Professional responsibilities</td>
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<td>Pathology Department Evaluation</td>
<td>Pathology Department</td>
<td>Review reports and reach consensus on judgment, present and confirm judgments</td>
<td>Report</td>
<td>Medical Education, access to result, time together, pathologist report</td>
<td>Shared resource, Producer/consumer</td>
<td>Departmental interactions</td>
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<tr>
<td>Record Findings in Patient Record</td>
<td>Pathologist</td>
<td>Identify ailment and record in charts</td>
<td>Patient record</td>
<td>Access to charts and Shared resources</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
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<tr>
<td>Perform Oncologist Diagnosis</td>
<td>Oncologist</td>
<td>Confirm lump is cancerous</td>
<td>Referral form</td>
<td>Access to patient, chart, references</td>
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<td>Activity</td>
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<td>Review Chart</td>
<td>Oncologist</td>
<td>Determine Patient condition</td>
<td>Patient records</td>
<td>Access to chart</td>
<td>Simultaneity constraints, Shared resources</td>
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<td>Question Patient</td>
<td>Oncologist</td>
<td>Determine Patient condition</td>
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<td>Access to patient</td>
<td>Simultaneity constraints, Shared resources</td>
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<td>Examine Patient</td>
<td>Oncologist</td>
<td>Determine Patient condition</td>
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<td>Access to patient</td>
<td>Simultaneity constraints, Shared resources</td>
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<td>Consult References</td>
<td>Oncologist</td>
<td>Check for information and clarification</td>
<td>Literature, notices</td>
<td>Access to references</td>
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<tr>
<td>Check for Pharmacological Conflicts</td>
<td>Oncologist</td>
<td>Ensure Patient can receive pharmacological treatment</td>
<td>Literature, notices</td>
<td>Access to references</td>
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<td>Confirm Patient Condition and Record</td>
<td>Oncologist</td>
<td>Document diagnosis</td>
<td>Patient record</td>
<td>Access to patient records</td>
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<tr>
<td>Select From Treatment Options</td>
<td>PCP, Specialist</td>
<td>Establish next step</td>
<td>Documentation, knowledge</td>
<td>Education, accurate information</td>
<td>Producer/consumer, Shared resource</td>
<td>Phone, chart, published guidelines</td>
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<tr>
<td>Generate PCP Treatment Choice</td>
<td>PCP</td>
<td>Choose proper treatment measure</td>
<td>Recommendations report</td>
<td>Guidelines, common language, access to Patient</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
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<tr>
<td>Assemble Patient, PCP, and Surgeon</td>
<td>PCP, Surgeon, Oncologist</td>
<td>Work together to determine best next step</td>
<td>Report</td>
<td>Common language, cooperation</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, common medical understanding</td>
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<tr>
<td>Discuss Options</td>
<td>PCP, Surgeon, Oncologist</td>
<td>Work together to determine best next step</td>
<td>Discussion</td>
<td>Common understanding of situation and malady</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling</td>
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<tr>
<td>Select Treatment</td>
<td>PCP, Surgeon, Oncologist</td>
<td>Select best treatment</td>
<td>Report</td>
<td>Common understanding of treatment options and components</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, common medical language</td>
</tr>
<tr>
<td>Generate Review Board Choice</td>
<td>Tumor Board, PCP, Surgeon, Oncologist</td>
<td>Choose proper treatment measure, allocate Shared resources</td>
<td>Patient Records</td>
<td>Opinions of board, availability of resources, current medical trends</td>
<td>Shared resource, Producer/consumer</td>
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<td>Assemble Review Board</td>
<td>Tumor Board, PCP, Surgeon, Oncologist</td>
<td>Work together to determine best next step</td>
<td>Report</td>
<td>Common language, cooperation</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, common medical understanding</td>
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<td>Discuss Options by Reviewing Record</td>
<td>Tumor Board, PCP, Surgeon, Oncologist</td>
<td>Work together to determine best next step</td>
<td>Discussion</td>
<td>Common understanding of situation and malady</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling</td>
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<tr>
<td>Select Treatment</td>
<td>Tumor Board, PCP, Surgeon, Oncologist</td>
<td>Select best treatment</td>
<td>Report</td>
<td>Common understanding of treatment options and components</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, common medical language</td>
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<tr>
<td>Perform Intervention</td>
<td>PCP, Specialist, Nurse</td>
<td>Treat malady</td>
<td>Documentation, Patient condition</td>
<td>Facilities, money, Patient, permission, treatment selection</td>
<td>Producer/consumer, Shared resource</td>
<td>Phone, institution, contracts, relationships</td>
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<td>Provide Surgical Treatment</td>
<td>Surgeon</td>
<td>Remove cancerous cells</td>
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<tr>
<td>Prepare Patient</td>
<td>Nurse</td>
<td>Prepare Patient both mentally and physically for drug administration. Patient education is important here.</td>
<td>Documentation, educated Patient</td>
<td>Access to Patient, facilities, previous orders</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
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<td>Review Patient Chart</td>
<td>Surgeon/Nurse</td>
<td>Determine Patient Condition, past</td>
<td>Chart</td>
<td>Accuracy of and access to information</td>
<td>Shared resource</td>
<td>Chart tracking and delivery system</td>
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<td>Question and Educate Patient</td>
<td>Surgeon/Nurse</td>
<td>Determine current condition</td>
<td>Chart</td>
<td>Access to Patient, Patient desire to be educated</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling</td>
</tr>
<tr>
<td>Cloth Patient for Procedure</td>
<td>Nurse</td>
<td>Prepare Patient for procedure</td>
<td>Ready Patient</td>
<td>Facilities, time, money, scheduling</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical system</td>
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<tr>
<td>Administer Medication</td>
<td>Nurse</td>
<td>Provide Patient with necessary medications</td>
<td>Treated Patient, documentation</td>
<td>Inventory and facilities availability</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
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<td>Move Patient</td>
<td>Patient, Nurse, Orderly</td>
<td>Transition to next stage of care</td>
<td>Permission by physician, patient charts</td>
<td>Permission, access</td>
<td>Prerequisite constraints, usability, approval</td>
<td>Physician review</td>
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<tr>
<td>Perform Intervention</td>
<td>Nurse, Surgeon</td>
<td>Perform procedure</td>
<td>Healthier Patient</td>
<td>Facilities, education, time</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical education/accreditation system</td>
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<tr>
<td>Perform Lumpectomy</td>
<td>Surgeon</td>
<td>Remove cancerous lump</td>
<td>Healthier Patient</td>
<td>Facilities, education, time</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical education/accreditation system</td>
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<tr>
<td>Perform Partial Mastectomy</td>
<td>Surgeon</td>
<td>Remove cancerous part of breast</td>
<td>Healthier Patient</td>
<td>Facilities, education, time</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical education/accreditation system</td>
</tr>
<tr>
<td>Perform Total Mastectomy</td>
<td>Surgeon</td>
<td>Remove entire breast</td>
<td>Healthier Patient</td>
<td>Facilities, education, time</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical education/accreditation system</td>
</tr>
<tr>
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<tr>
<td>Perform Radical Mastectomy</td>
<td>Surgeon</td>
<td>Remove entire breast</td>
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<td>Facilities, education, time</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical education/accreditation system</td>
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<td>Perform Reconstructive Surgery</td>
<td>Surgeon</td>
<td>Rebuild breast form</td>
<td>Healthier Patient</td>
<td>Facilities, education, time</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical education/accreditation system</td>
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<tr>
<td>Perform Gland Removal</td>
<td>Surgeon</td>
<td>Remove hormonal glands</td>
<td>Healthier Patient</td>
<td>Facilities, education, time</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, medical education/accreditation system</td>
</tr>
<tr>
<td>Move Patient</td>
<td>Patient, Nurse, Orderly</td>
<td>Transition to next stage of care</td>
<td>Permission by physician, patient charts</td>
<td>Permission, access</td>
<td>Prerequisite constraints, usability, approval</td>
<td>Physician review</td>
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<tr>
<td>Provide Radiological Treatment</td>
<td>Radiologist</td>
<td>Kill cancerous cells</td>
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<tr>
<td>Prepare Patient</td>
<td>Nurse</td>
<td>Prepare Patient both mentally and physically for drug administration. Patient education is important here.</td>
<td>Documentation, educated Patient</td>
<td>Access to Patient, facilities, previous orders</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
</tr>
<tr>
<td>Treat with Radiation</td>
<td>Radiologist</td>
<td>Perform radiation therapy</td>
<td>Irradiated Patient</td>
<td>Facilities, medical orders, authorization</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, MC</td>
</tr>
<tr>
<td>Move Patient</td>
<td>Patient, Nurse, Orderly</td>
<td>Transition to next stage of care</td>
<td>Permission by physician, patient charts</td>
<td>Permission, access</td>
<td>Prerequisite constraints, usability, approval</td>
<td>Physician review</td>
</tr>
<tr>
<td>Provide Chemotherapy Treatment</td>
<td>Oncologist</td>
<td>Kill cancerous cells</td>
<td></td>
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</tr>
<tr>
<td>Prepare Patient</td>
<td>Nurse</td>
<td>Prepare Patient both mentally and physically for drug administration. Patient education is important here.</td>
<td>Documentation, educated Patient</td>
<td>Access to Patient, facilities, previous orders</td>
<td>Shared resource, Producer/consumer</td>
<td>Medical system</td>
</tr>
<tr>
<td>Administer Medication</td>
<td>Nurse</td>
<td>Provide Patient with necessary medications</td>
<td>Treated Patient, documentation</td>
<td>Inventory and facilities availability</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
</tr>
<tr>
<td>Administer Drugs</td>
<td>Nurse</td>
<td>Provide Patient with necessary medications</td>
<td>Treated Patient, documentation</td>
<td>Inventory and facilities availability</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
</tr>
<tr>
<td>Administer Hormones</td>
<td>Nurse</td>
<td>Provide Patient with necessary medications</td>
<td>Treated Patient, documentation</td>
<td>Inventory and facilities availability</td>
<td>Shared resource, Producer/consumer</td>
<td>Scheduling, facilities management</td>
</tr>
<tr>
<td>Move Patient</td>
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<td>Transition to next stage of care</td>
<td>Permission by physician, patient charts</td>
<td>Permission, access</td>
<td>Prerequisite constraints, usability, approval</td>
<td>Physician review</td>
</tr>
<tr>
<td>Activity</td>
<td>Actor</td>
<td>Goal</td>
<td>Artifacts</td>
<td>Dependencies</td>
<td>Type of Primary Dependency</td>
<td>Coordinating Mechanisms</td>
</tr>
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<tr>
<td>Provide Psychological Treatment</td>
<td>Psychiatrist, PCP, Social Worker, Specialist</td>
<td>Provide Patient with ongoing counseling as needed</td>
<td>Calmer, less hysterical Patients</td>
<td>Time, sensitivity to Patient needs</td>
<td>Shared resource</td>
<td>Relationships between Patients and Providers</td>
</tr>
<tr>
<td>Prepare Patient</td>
<td>Psychiatrist, PCP, Social Worker, Specialist</td>
<td>Work with Patient to understand procedures, issues</td>
<td>Calmer, less hysterical Patients</td>
<td>Time, sensitivity to Patient needs</td>
<td>Shared resource</td>
<td>Relationships between Patients and Providers</td>
</tr>
<tr>
<td>Perform Psychological Treatment</td>
<td>Psychiatrist, PCP, Social Worker, Specialist</td>
<td>Provide counseling, drugs, therapy and support as needed</td>
<td>Mind body connection in recovery process</td>
<td>Time, facilities, access to Patients, support services</td>
<td>Shared resource</td>
<td>Communication between Providers, insurers and Patient</td>
</tr>
<tr>
<td>Move Patient</td>
<td>Patient, Nurse, Orderly</td>
<td>Transition to next stage of care</td>
<td>Permission by physician, patient charts</td>
<td>Permission, access</td>
<td>Prerequisite constraints, usability, approval</td>
<td>Physician review</td>
</tr>
<tr>
<td>Provide Recuperative Medical Care</td>
<td>Specialists, PCP, Nurse</td>
<td>Continued road to recovery</td>
<td>Documentation, health</td>
<td>Shared resources, information, knowledge of best practices</td>
<td>Producer/consumer, Shared resource</td>
<td>Case management, Patient</td>
</tr>
<tr>
<td>Assess Medical Condition</td>
<td>PCP, Specialists</td>
<td>Determine condition</td>
<td>Documentation, knowledge</td>
<td>Knowledge, Patient access, chart</td>
<td>Producer/consumer, Shared resource</td>
<td>Phone, facilities, scheduling</td>
</tr>
<tr>
<td>Perform Recuperation</td>
<td>PCP, Specialist, Patient</td>
<td>Provide adjunctive care</td>
<td>Referral form</td>
<td>Availability of specialists and equipment</td>
<td>Producer/consumer, Shared resource, Simultaneity</td>
<td>Scheduling, first come/first serve</td>
</tr>
<tr>
<td>Provide Counseling</td>
<td>Counselor</td>
<td>Restore emotional and mental state</td>
<td>Referral form</td>
<td>Availability of specialists and equipment</td>
<td>Producer/consumer, Shared resource, Simultaneity</td>
<td>Scheduling, first come/first serve</td>
</tr>
<tr>
<td>Provide Physical Therapy</td>
<td>Physical Therapist</td>
<td>Restore mobility to shoulder, arms, and torso</td>
<td>Referral form</td>
<td>Availability of specialists and equipment</td>
<td>Producer/consumer, Shared resource, Simultaneity</td>
<td>Scheduling, first come/first serve</td>
</tr>
<tr>
<td>Move Patient</td>
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<td>Physician review</td>
</tr>
</tbody>
</table>
APPENDIX C

INTERVIEW NOTES
(Note: All names of people and locations have been masked. )

Interviewee: Chief Executive Officer, "Joe"
Location: Hospital-1
Date: 7 December 1994

Our site advisor introduced our project and the three main areas in which the center is interested: Coordinating mechanisms, dependencies and representation of capturing processes. The process should support patients across primary, secondary and tertiary care. We want to look at parts of larger organizations that need to cooperate. One of the drivers will be incentives. This is currently activity based for the clinicians. Another driver will be disaggregated information. But information is indeed needed throughout the continuum of care.

Joe agreed that IT is needed to manage patients across levels of care, perhaps even across geographical boundaries. We should look at how care is given longitudinally. There is currently an industry wide emphasis on preventative care, done outside of the traditional hospital walls. Looking at national trends, the Health Care Advisory Board, with 1100 member hospitals, looks at best demonstrated practices. He suggested considering home care, or sub acute care. Or at looking at patients when they are not critically ill, such as diabetics or high risk mothers. Who do practitioners currently choose to follow quite closely, and why? There are different approaches being taken but technically and organizationally across the country. How could such a system look for a single hospital? He suggested we look at a single institution.

Several ideas were provided for possible areas to examine closely: Practice protocols and guidelines, types of technology being used, organizational implications and successful/failed implementation of both. Joe suggested we look at different organizational forms, for instance places where doctors are actual employees of the hospital vs. not. How do control systems work? What are the dependencies? Do they operate differently? Each system would have different incentive structures as well.

Do doctors respond to data? What are the organically driven cultural norms. How much of tangible vs. intangibles are driving the system? Are hospitals providing the community services needed? What are meaningful indicators? Hospitals are becoming more publicly responsible, and need to expand their mission beyond what health care institutions are doing today.

Interview: Consultant, "Mary"
Location: Hospital-1
Date: 2 February 1995

We described the work we were doing, and explained that we are looking for things that fall through the organizational cracks, are not managed properly and where there is a lack of coordination.

Mary discussed protocol development. The focus is on "what". Decision trees are being developed, looking at "what" is done. There is no attention to coordinating mechanisms in clinical protocol development. This is the basis of Kaiser Plans, books with decision trees. Often the "what" doesn't happen. E.G. an older doctor does not know new medical protocols, or the major caregiver is simply unaware of protocol existence or changes.
Example: stroke patients: receive acute treatment in the hospital, then transition into rehabilitation. This treatment plan is very common, very expensive and has vastly different outcomes. The treatments will vary patient to patient, based on what an individual can tolerate. When a patient moves to rehabilitation they go into the care of someone else, someone new. The communication between providers on condition and capabilities is often incomplete due to the lack of relationships between the providers. Some institutions are good at ensuring that all information gets passed along with the patient. A critical issue is how the primary care doctors work with the specialists.

What happens in a group where the doctors are not organized? Under capitation, what will happen where $S$ are so tight? There is currently no informal structure that allows needed communications to occur. What can be done to create a compensating structure?

Mary recommended that we identify critical points of communication in a treatment process or diagnosis, across the entire continuum of care. We should identify breakdowns, barriers, what gets in the way. We should focus on types, frequencies, relationships between the breakdowns and organization forms.

**Interview:** Chief Executive Officer, "Joe"
**Location:** Outpatient Medical Clinic-A
**Date:** 2 February 1995

There are different types of HMOs, for example straight HMO, PPO, etc. Under a straight HMO the providers are under contract with the HMO, anyone outside "the network" is not paid for. Under "preferred provider" programs, any provider in the network is covered in full, those outside are covered 70%. There is more freedom to choose for the patients.

Most employers pay for the insurance. They sign a contract with an HMO, which delineates which services will be provided and at what premiums. The premiums are different, often dependent on the population and demographic distribution. Employees do get some choices. They can choose the primary care provider from whom they want to receive care: pediatrician, internist or family practitioner. They must pick one, at a specific location. This is then considered to be the patient "home site" and "primary care physician" (PCP).

Clinic-A then has a contract with HMO-1 to provide care. Capitated payments are received. All professional services must be provided. Under managed care, Clinic-A receives payments per patient per month. Clinic-A then establishes its own contracts with specialists to provide care when required. Joe negotiates these contracts with the specialists himself. A fee schedule is used, a list put out by HMO-1, covering any medical treatments that are "usual, customary and reasonable". Occasionally a lower contract can be negotiated. Clinic-A can get a history from HMO-1 on their own historical costs. A check is received February 1 for January services.

Clinic-A is responsible for the continuum of care. The specialists must provide proof that they are covered by malpractice insurance. Specialists are contracted with individually. For instance, at Hospital-1 Clinic-A has contracts with only 8 of 13 cardiologists.

An encounter form is used for each patient visits. The patient goes to the cashier after being seen to pay the co-payment. Encounter forms are each processed. Clinic-A can tell who has spent how much, when. For example, a patient comes in with a pain in the arm. A chest x-ray is ordered, and a heart problem detected. The PCP must then fill out a referral form. The patient MUST see the specialist to whom they are referred if they are under the HMO umbrella. FFS patients can choose whom they want to see. The patient sees the specialist. The specialist then bills Clinic-A, based on a negotiated fee schedule. Referrals are extremely specific, stating exactly what services should be provided. The specialist must call the PCP to get permission to perform any other services not initially outlined.
A surgery referral often includes a pre-op and follow up visit with the surgeon in addition to the actual procedure itself. There are some "global surgical fees," as dictated by the insurers. Some surgeons do try to bill through unbundling, a discouraged practice. After surgery, if the patient requires physical or occupational therapy, a referral must be written. Usually 5 visits will be allowed. This is also true for any mental health services.

There is a hotline number, which patients are to call whenever possible. If they choose to go to another emergency medical center, it is possible the claims would be denied. This would happen if it is determined that the services could have been provided at Clinic-A. This is understood as part of the HMO-1 subscriber agreement. This can cause problems, in that the uneducated person might have his or her own threshold of "life threatening illness".

Clinic-A is at risk in the capitated arrangements. For example, Bone marrow transplants are considered experimental, and not covered by the HMO arrangements. This is also true for chiropractic, massage or holistic services sought by the patient.

The more frequently a patient comes in, the more it costs Clinic-A. The member dollars per month are received regardless of whether the patient actually comes in or not. "Re-insurance" means that once a patient has reached $15,000 in charges in the course of a year, HMO-1 will pick up any further costs themselves. In the population of 15,200 HMO-1 members, 25-30 will go over this threshold in a year. (Cancer, aids, open heart surgery).

Each floor has two nurses who do nothing more than triage. They answer calls, advising patients and making next step recommendations. This is a screening process to insure that patients really do need to be seen prior to arrival. The triage nurses have become "the grandmothers and aunts" of the population: there is no on else the patients can call to ask non-critical questions, such as how to nurse a baby, etc. The nurse will document all phone calls, call for the medical record, and make sure the PCP is aware of the interaction. Nurses will err on the side of the patient if there is a question. This is based on clinical judgment and the threat of malpractice.

Protocols are created at Clinic-A by the doctors themselves. Insurers offer guidelines themselves as well. Clinic-A looks at "what is normal in the area" in establishing internal guidelines. The same protocols are used regardless of the insurer.

Providers more or less put the patient first, though they are aware that costs are a key concern. "Physician extenders" are being used more frequently, such as Physician assistants, and non-ophthalmologists. This reduces overhead without jeopardizing patient care.

Fee schedules are examined frequently. HMO-1 releases a quarterly report, with weighted averages and comparative data. These schedules and CPT codes are the basis for charges.

Clinic-A holds open houses for new patients. Of the 300 invited, 3 might show up.

There is a need for a way to measure quality. It is difficult for non clinicians to measure clinical quality. How to judge is an issue. There are also concerns that bedside manner can be more important than actually clinical care, and perhaps that concern falls through the managed care cracks.

**Interviewee:** Chief Executive Officer, "Joe"
**Location:** Outpatient Medical Clinic-A
**Date:** 10 February 1995

Two types of health organizations are interesting:
HMO - Health Maintenance Organization; must contract with providers. Patients must use providers HMO designates. If they use another provider, there is no coverage.

PPO - Preferred Provider Network: insurance company designates a provider - a preferred provider. If the patient uses the preferred provider, the insurance company pays for it. If the patient goes somewhere else, the insurance company covers less.

This is the way the payment cycle works. The employer pays for the insurance for their employees. The employer contracts with an HMO for medical services. Actuarials are computed for the group to assess risk and premiums. Employees have the opportunity to choose from several HMOs from their employer. The employee then picks the HMO of his/her choice. The employee then chooses a physician that accepts that HMO coverage. The employee, in effect, is choosing Clinic-A and a physician. Clinic-A contracts with the HMO to provide professional services according to a capitation fee/enrolled patient/month. Any expenses above the capitation fee, Clinic-A must pay.

Clinic-A will use standards on costs to price work. They typically use the fee schedules provided by the issuing hospitals for patient services. There are two types of costs: direct medical costs and support costs.

The patient will come in to see the primary physician. They will use an encounter form to document the visit and recommend further medical work. Physician diagnosis the patient at Clinic-A, takes x-rays, and then recommends a specialist at Hospital-1 through a referral form. Through the referral form, Clinic-A determines who the specialist will be.

Hospital-1 bills Clinic-A for services rendered. Any procedures, in addition to those specified on the referral form, must be cleared through the Clinic-A physician. The primary care physician manages the care.

Global billing is used often to bill instead of traditional unbundled, itemized billing. There is a reinsurance program. Under this program, if any patient procedure goes above $15,000, the HMO will pay for the difference in the service costs. (Typical Clinic-A patient population: 15,200 members. Number of patients that exceed $15,000 in costs annually: 25.)

Nurses do triage telephone calls checking to make sure that the patients need to come in. Protocols exist for diagnosis & treatment and are used regardless of insurance companies. Medical protocols are developed with the patient’s care in mind first. Nurses are usually fairly defensive, opting for conservative recommendations. Documentation is lengthy and time consuming. Physicians may use nurse extenders. Like the ophthalmologist who looks at the patient at the end of the visit.

Clinic-A is responsible for the continuum of care. They serve as the gatekeeper and contract with specific specialists in the Hospitals for service. There has yet to be developed a real measure of quality. Non-clinicians cannot judge quality.

**Interviewee:** Chief Executive Officer, "Joe"
**Director of Finance, "John"**
**Location:** Outpatient Medical Clinic-A
**Date:** 16 February 1995

We will need to adjust our plan of attack as far as getting information is concerned. We will not have access as we had hoped to any patient specific information, due to issues of patient confidentiality. John suggested we focus on a particular DRG, and thus might have some billing information from which we could gather information.
We should be certain to include interviews with specialists, hospitals, and insurers in our research. Joe recommended the HMO-1 medical director, and a managed care innovator. In addition, the director of nursing responsible for protocols would be a good contact.

Clinic-A has 17 doctors, 14 of whom are stockholders, 3 not. These 3 have a set salary with a contract of 12-18 months. The stockholders are paid according to the following algorithm: 85% production (transparent to the doctors themselves, measured by Clinic-A fee schedules), 10% intangibles (talks, administrative value), 5% seniority within the group.

The only difference between HMO and FFS patients in that FFS patients can go wherever they want. HMO patients are referred to either Hospital-1 or Hospital-2 for major procedures. Many of the HMO breast cancer patients for instance would prefer to be seen at the Hospital-3 (reputation) but are not able to due to the arrangements mentioned above.

There are no clinical differences in the direction the care will take. There is no change in quality. From a business point of view however the differences are enormous. Under managed care, Clinic-A can negotiate contracts, and payment schedules, utilizing bulk fees. Non managed care leaves Clinic-A with virtually no say in what charges will be issued. Non managed care results in more fragmented care, and deteriorates without some sort of a gatekeeper.

Clinic-A saw 70,000 patients last year, 15,000 of whom were HMO-1 (20%). These patients account for 50% of the visits to Clinic-A. HMO-1 focuses on preventative medicine, encouraging the patients to come in for "every little thing". In addition, employees are increasingly paying more of their health insurance themselves, and want to get their moneys worth. There appears to be an "entitlement" attitude, and a misconception about what preventative medicine really is. The desire is actually to have patients come in for screening regularly. Patients are seen by the doctors at Clinic-A. The major expense incurred by Clinic-A are referral expenses. They would prefer to stop the illness before the patients are truly ill. When someone gets laid off, they tend to continue to come to Clinic-A but only in order to receive treatment for their children.

Clinic-A is paid on a modified fee for service arrangement. Referral tracking and patient management are almost identical tasks. Under managed care, organizations will try to do as much of the treatment as they can in house. There are some indemnity patients, who want to see a specialist even though the doctor doesn't feel it is necessary: this doesn't "make cents or sense". Actual treatment and care of the patients does not actually change. Clinic-A can insist that care be done on site for HMO patients, whereas other patients can go elsewhere.

Over medication is one of the #1 problems in non managed cases. When management of care is not coordinated, there are problems with pharmacological interactions that harm patients.

Studies show that preventative medicine is saving lives. The concept of HMO's has been around since W.W.II. Currently more and more things are being done at home, out of the hospital. Sub acute nursing homes centers are being created, that are treating 30 year olds with (for example) knee replacements.

There are 50% too many hospital beds in the greater Boston area. Many of the services and treatments could be conducted at centers like Clinic-A. For example, pacemaker insertion: Hospital-1 charges Clinic-A $590 facility fees. Doctors at Clinic-A can perform the procedure in their offices now for $150 base fees. They assume the liability and are allowed only to use general anesthesia. Many more procedures than are currently being performed in house could be. The procedures that will never be able to be brought inside are life threatening emergencies and planned complex surgeries.

Mental health coordinators sit down and talk to the patients, assess the level and type of services required and approve a limited amount of treatment. Psychiatrists tend towards long term care rather than short term, and medications where perhaps they are not required.
Clinic-A does not have a computerized medical record. It is seen "down the road". Hospital-1 already has at least some components of a record on line.

"We are proud of the quality of care and the innovations we have". For instance, Clinic-A negotiates with surgeons on in office surgeries vs. in hospital procedures. For example, Dialysis: OPD or in house? At home it is much less expensive and more efficient. The centers can become constant reminders of the patients condition, but at the same time can offer patients contact with others with similar conditions. At home, the machine can be a constant reminder itself, and there is a great deal of responsibility involved in monitoring both patient condition and hardware.

**Interviewee:** Primary Care Physician, "Tom"

**Location:** Outpatient Medical Clinic Clinic-A

**Date:** 1 March 1995

Tom is a primary-care/internist at Clinic-A. He described the breast cancer treatment process:

There are virtually no preventative measures available to combat breast cancer. Medical literature and experts believe that diet may help, but he wasn’t convinced that it does. He also said that preventative mastectomies are done in high risk patients.

There are 3 detection methods:

1) The patient finds a lump or abnormality during a breast self examination (BSE)
2) The primary care physician (PCP) finds the abnormality during a routine exam
3) A radiologist finds the abnormality

The timing between detection and treatment is important. The shorter the time frame, the better the chances are for survival. Many patients who self diagnose are slow to report it to their doctor because they are afraid of the outcome. That fear causes delay in treatment.

Once the PCP discovers the abnormality (which we will assume is a lump), the patient is scheduled for a mammography in the same day if possible. The timing is not as critical pathologically as it is psychologically for the patient. Making the patient wait makes the patient endure unneeded stress.

The radiologist then performs the mammography. If the mammography shows a tumor, the patient is scheduled for an appointment with a surgeon to biopsy the tumor. The biopsy is performed at Hospital-1. Once the biopsy is completed, the specimen is examined by the pathologist to determine whether or not it is malignant.

If the tumor is malignant, the PCP, the surgeon, the oncologist, and the patient discuss treatment options. Once an option is chosen, the patient’s case is presented to a cancer review panel. This panel is made up of professionals from the Boston community who review the case, providing a second opinion and certifying the prognosis. The oncologist and the radiation therapist may sit in on the panel to argue the original prognosis if necessary.

Once approved for treatment, the patient undergoes a combination of surgery, radiation treatment and/or chemotherapy. The radiation therapy is performed at facilities outside Hospital-1.

Follow-up exams are scheduled as needed with the radiation therapist, the oncologist, the plastic surgeon, and the PCP. Specialists typically attempt to influence the PCP to approve follow up treatment. The risk of over-examination is most pervasive here partly because specialist’s incentives of more work, more business does not correlate to the PCP’s attempts to manage the patient’s care and health costs to the practice. PCPs can prevent...
specialists from over-treating patients because they select the specialists as part of the HMO plan. If threatened from specialist groups, Clinic-A can work around specialists or deny them access to patients.

He sees differences in different payment schemes:

**Fee for Service**

- No incentive for innovation.
- Referral process is at the discretion of the patient--they decide where they want to go.
- Better patient satisfaction.

**Health Maintenance Organization**

- More incentives to innovate and streamline medical care delivery.
- Referral process is in the hands of the PCP and the HMO.
- Lower medical care costs.

Clinic-A audits their charts to see if PCPs are asking patients if they are doing their BSEs. It is part of Tom’s responsibilities and helps promote early detection.

Other recuperation sources are support groups and physical therapy. These are recuperative activities.

There are incentives for getting the diagnose right the first time:

- the sicker the patient is, the more it costs to treat them.
- records are audited continuously by the HMOs.
- the high litigation/lawsuit costs make it more attractive to get it right.
- patients may accuse the PCP or others of skimping on care to keep costs down.

Tom wears many hats: medical doctor, manager of other MDs, manager of a small business.

The move to network services may be an attempt on the part of organizations to: “be as big a fish as possible to swallow up the other fish before they are swallowed themselves!”

Treatment guidelines are helpful. They use many different sources for guidelines including the HMO-1. However, it does provide one more way for patients to sue physicians. Clinic-A makes a conscious choice which guidelines to follow and which to ignore.

HMO Blue looked at approximately 6 different organizations for appropriate guidelines and then consolidated a list of guidelines based on the processes that prescribed the fewest procedures. He thinks the rational was a bit questionable.

IT is needed to flag when something in the complicated chain of health care delivery doesn’t happen.

MDs are resistant to accepting the inevitable responsibility for a patient’s behavior. This is an extra responsibility of making sure the patient shows up for specialists consultations, takes prescribed medications, etceteras.

Nursing homes are moving to sub-acute care facilities because the cost of treatment is cheaper. Overhead can be as much as 4 times cheaper ($250 compared to $1,000).

Innovative activities include:
• Quality Assurance - using the hospital’s billing database to track diagnoses. Diagnoses are checked for those that were changed and those that had follow-up diagnoses that differed from the original diagnosis.
• Sub-acute care in nursing homes.
• Computerized link-ups allowing two physicians to consult over a multimedia line—telemedicine.

Primary care does the management of care. That is a good thing. He believes physicians must continue to be part of the management of the practice as well as the deliverers of health care.

**Interview:** Director of Finance, "John"
**Location:** Outpatient Medical Clinic-A
**Date:** 3 March 1995

The Primary Care Physician (PCP) refers patients to specialists. If there is a clinical reason to do something, it is done without regard to financial issues. There is a referrals department that sends out all referrals, gets the necessary authorizations, essentially says it is OK to treat the patient. The PCPs will do whatever is clinically necessary, regardless of financial class. Claims are submitted, sent to finance, where claims are matched against written referrals and authorizations.

Claims are entered into a computer. There is information for each payer regarding how quickly each party is obliged to settle the claims. Once a week, a selection register is run, pulling out any bills due the following week. These are all reviewed by the claims manager. The list is either edited or approved in its entirety. Checks are cut to the payers where appropriate. The claims manager checks the "bottom line", and the adherence to contracts.

Temporary authorizations are also sometimes issued by the payers. These also get entered into the computer. The claim is not actually authorized. It is returned to the PCP, the chart is ordered with all of the patient notes. The PCP says yes or no. Claims are rejected if the procedure could have been done at Clinic-A, or not at all. (These are services for which Clinic-A is billed by the specialists with whom they have contracted out.) The contracts between Clinic-A and the specialists all include clauses regarding "unauthorized services". Patients can not be billed twice for the same service.

There are also "global fees", cases paid at the end with a global fee. For example, during the course of a pregnancy, how care is provided from the first doctor visit through to birth. The OB doctor gets no money from Clinic-A until the birth of the baby has occurred. The global fee includes follow visits where necessary as well.

Patients who need to see an oncologist are all referred out. These contracts are not set prices, as each case is so different. Mammographies and biopsies are done under global fees structures.

The insurance companies have people reviewing Clinic-A periodically for compliance. HMO-1 is capitated, HMO-2 is managed care but not capitated, others make fee payment/charge suggestions. Billing is based on CPT codes. Some codes are "bundled", encompassing several different procedures. One of the historic abuses in the system has come from trying to unbundle related charges. Utilization reports are run, and management queries are done on the claims database.

Each insurance company has its own fee schedule. Clinic-A tries to get specialist to agree to third party fee schedule. "why reinvent the wheel." Current contracts are both higher and lower than the suggested fee schedules. Most contracts are for two years, though some are for one, some are rolling.
Under sub capitation Clinic-A could tell specialists not to see patients from anywhere other than Clinic-A. In exchange, we will send you 100% of our business. Clinic-A can not contract with a group of specialists if they are not already an official business group. (Anti trust laws)

There may be more expenses up front now than there used to be, but this is in the hopes of saving money in the long term. Clinic-A has a membership base, of which only x% actually become patients. Clinic-A relies on this fact. There are patients who never come in, who receive routine care, or who need to be seen by specialists. There is no magical break even point, but in the aggregate Clinic-A needs to make money. "Our profit as an industry relies on the outcome of what we predict will happen given a particular population."

Specialists are coordinated through pre-managed care. There is some collaboration between PCP and specialist but records and control remain with the PCP. Managed care actually provides the PCP with a more complete medical record.

What's wrong? There is an inherent flaw in managed care. It is known, but ignored. The better you manage care, and the more money you make, the lower your reimbursements will be for the next year. PCPs are creating a more efficient atmosphere and delivery system. There is market pressure to bring costs down as well. But they are penalized for saving money.

Capitation is negotiated. HMO-1 wants to pay monthly membership fees, $70 per member per month. This is based on actuarial tables, the population, etc. Clinical costs per patient per month are usually $30, administrative $5, specialists $30, substance abuse, $5, etceteras; the profit being approximately $1 per patient. Clinic-A can not ask HMO-1 what they are paying another clinic for instance. Perhaps that clinic charges more because they do not do things as well or efficiently as Clinic-A, and receives $90 per patient per month.

Other insurance companies want to lower the costs they are paying Clinic-A because the costs are so low. Clinic-A would like to be, needs to be paid the going rate. "What is reasonable and just compensation?" The incentives are off. Population size compensation is also not paid enough attention to.

**Interviewee:** Director of Nursing, "Jane"
Nurse Manager, "Susan"

**Location:** Outpatient Medical Clinic-A
**Date:** 9 March 1995

**Protocols**
There are no written protocols used by the triage nurses at Clinic-A. There are however protocols used by the physicians themselves.

**Triage Nurses**
Triage nurses are hired to be just that. They are required to spend some time on the floors to keep their skills updated. They rotate through on a regular basis. The work is not as stressful as work would be at a hospital. They are not paid as much, but it is considered to be a more secure job. They work closely with the physicians, and keep their practice skills updated.

Medical assistants (MA) are also used. At Clinic-B, they actually perform much of the work Jane feels nurses should be doing. At Clinic-A MAs do a little bit of the work, such as taking blood pressure, weights, etc.

95% of all patients enter Clinic-A through the triage nurses. The nurses have a Kardex file, and a three ring binder used to walk patients through the phone calls received. Both are updated internally, by Jane and co., including input from the physicians. Some institutions have actual decision trees that are used, but Clinic-A does not use this methodology. There are some written guidelines in place, written by Jane, but for the most
part the nurses know what questions to ask and what the next steps should be based on professional training, and learning from each other.

The nurses use a message book (multiple copy) to record each and every call. Patient name, birthday, primary doctor, problem and disposition. Any advice given is recorded. A copy of the message goes to the PCP, who must sign off on it before it can be placed in the medical record.

The nurse then transfers the patient, if required, to the appointments line. The nurse tells the appointment person when the patient needs to be seen (e.g. today, within a week, etceteras) and by whom (PCP, nurse, medical assistant). Some patients will refuse to make appointments. If this occurs, the receptionist notifies the nurse, who documents the incident and alerts the PCP.

If a patient calls into triage having discovered a lump in her breast, an appointment is immediately set up, there is no second guessing done. Where possible, an appointment will be made with the PCP, although the patient may be seen by urgent care is needed.

If there are insurance specific questions, the patient is referred to a "patient advocate". There is one on each floor for HMO-1, others to handle other insurers. These advocates act as clearing houses for the patients, getting them answers regarding insurance related issues without the patients having to call the insurer directly. It helps keep the patients "not anxious".

**Mammography**

They need a better PCP tickler system, and are in the process of trying to put one on the computer system. The ideal system will have a reminder letter sent to patients who have not had mammography reports sent back to Clinic-A within 2 months that would be automatically printed. The PCPs check each letter before it is sent out, and will when necessary call the patients directly to checkup on the case.

Clinic-A does not perform mammographies on site. Most patients are referred to Hospital-1, though FFS patients may choose to go elsewhere. For those patients examined at Hospital-1, there can be lengthy delays in getting back the results, as long as 6 weeks. These are of course the non positive results.

One major issue of concern is not having access to previous mammograms. Ideally previous mammograms would be available for comparison purposes. Many patients change location or insurer frequently, and thus do not have mammograms performed at the same location each time. Most patients do not bring the actual images with them when they transfer into Clinic-A care. In order to get the images, the patient has to sign consent forms, and the records must be sent to Clinic-A. This can be lengthy, if it happens at all. This frequent changing of insurers seems to be happening more and more frequently, and this lack of comparative images is becoming more of an issue. Patients need to have confidence in the performing facility.

Another issue that arises is the difference between how frequently a mammography is recommended and what the insurance company will pay for. Nurses do not take responsibility for recommending a mammography be done, PCPs do. Even then, they can not insist but only recommend it be completed.

**New Patients**

All new patients (HMO) to Clinic-A are required to receive a physical. During this visit, the PCP will ask the patient about their mammography, breast cancer, and self examination histories and practices. Each new patient is required to sign on to a particular PCP, though they are not then necessarily required to use them.

**The Process**

The patient is seen by the PCP. If necessary, they are then referred to a specialist. Most patients are not immediately referred out, though there are exceptions to that rule.
Once seen by the specialist, the patient might call back in to the triage desk for advice, reassurances etceteras. (Am I doing the right thing? Should I see my doctor?) Again, all of these calls are recorded and become a part of the medical record.

Occasionally pre-op work will be conducted at Clinic-A, though it is usually done at the specialists office. Most patients receive one post-op visit with the surgeon, though additional visits may be requested. Post-op work done at Clinic-A includes irrigations, dressing changes, packing and IV therapy. These procedures are done primarily for HMO patients, FFS patients continuing their care with the surgeon.

One thing that is considered important at Clinic-A is continuity of care. If a patient is either coming in on a weekend, or being seen by someone other than their PCP, the nurse in charge of that visit will make contact with the nurse/provider usually seen, and take responsibility for knowing exactly what is going on, needs to happen to the patient. This helps keep costs down, as only necessary procedures are conducted.

Hospital-1 is relied upon for some of the patient related in-services, such as a porto cath placement. This is a specific, highly technical procedure. Hospital-1 held an in-service to train Clinic-A nurses how to perform the procedure on site. Another example where another institution is involved in patient care involves the Visiting Nurse Association, VNA. When a patient has a central line, and is currently seen at home, but for whatever reason will now be seen at Clinic-A, the VNA nurses will come with the patient for the first few visits. The Clinic-A nurse will perform the procedure, with guidance from the VNA nurse. This insures that there is continuity of care for the patient, and aids in making the patient comfortable with the transition.

**HMO Effects**
The patient management that occurs under the HMO umbrella tends to result in less tests being performed, repeat or unnecessary procedures being done. As clinics such as Clinic-A turn change their practices to accommodate the demands of the HMOs, changes are also seen in the care of other patients, a carry over effect to FFS patients and their care.

HMOs are very concerned about cost. There are financial incentives to bring procedures in house. An example of the high cost of home care: it costs $250-$300 a day for I.V. therapy to be given in the home. Many FFS patients do not have insurance that covers home care, so it is done at Clinic-A. For HMO patients, it is a decision made by the patient advocate, who is called in upon the request of either the PCP or the patient. Home care is more expensive.

No clinical decisions are made based upon a patients insurance status or insurer.

**Outcomes**
The lab manager is very concerned with quality control. Test results and trends among patients are routinely scrutinized. For example, "quickie screens" are routinely used on urinalysis tests using dipsticks, which must be read at exactly 66 and 120 seconds. The reader can easily get distracted at the EXACT second the reading is required, and the results are thus less than reliable. "Quality issue." The lab manager had been monitoring the situation and recently purchased a machine that accurately reads the dipsticks at the appropriate times. Many changes in medical practices are made based on intuition. No specific outcome studies are conducted at Clinic-A. But doctors and nurses confer on a regular basis and appropriate practice changes made accordingly.

Clinic-A must submit information every year to the Massachusetts Professional Insurers Association with result and patient information.

Due to the medical management practices, and the use of triage nurses, the rate of visits is kept low at Clinic-A.

**Miscellaneous**
There is a pediatrician and an internist on call everyday, on site, with no scheduled appointments. They handle all urgent care appointments. The providers rotate this service.

Each PCP has an hour of "call time" during the day, when patients can call in and talk to them directly. This information is given out to patients throughout the day. "Dr. Doe's call time is 12-1, please call back then." If this recommendation is given, the nurse will see that the MR is pulled prior to the time frame and alert the PCP as to why the patient is calling.

Appointments can be made for a physician or a nurse. A nurse can "drag a doctor in when needed."

Negative documentation is not routinely written. (E.G. The following tests were not performed because...)

Hospital-1 is computerized, Clinic-A is not (with the exception of some lab results). Clinic-A personnel have direct access to the Hospital-1 information.

Interviewee: Primary Care Physician, "Joe"
Location: Outpatient Medical Clinic-B
Date: 9 March 1995

Joe suggests that we contact someone in "non group" practice at Hospital-1. He believes major differences would be seen throughout our project if we investigated both solo and group practitioners. Groups have a more integrative capability, offer more points of contact for the patients.

Clinic-B has relationships with individual businesses, companies, and partners. Each provider and payer in contact with Clinic-B has a contractual relationship with Clinic-B. HMO-1 has an exclusive arrangement with Clinic-B, and accounts for 50% of the patients seen. (Exclusive meaning Clinic-B may not have any other HMOs with whom it works.) It is the responsibility of Clinic-B to provide all primary care and professional services, including OPD consults and procedures and inpatient consults. They are not required to provide inpatient procedures.

Many of the OPD procedures are contracted out, often to Hospital-1. A daily fee is negotiated annually with Hospital-1 for the use of the facilities. Many of the specialists used operate under strict contract payments or sub-capitation. HMO-1 has a recommended fee schedule for these PCP-specialist contracts but each clinic/organization may establish its own contract rates with each provider or institution. If a specialist does not want to work within the contract limitations proposed by Clinic-B, Clinic-B will simply stop sending patients their direction. These contracts are usually established by Joe (managing partner), the CEO and the Clinic-B managed care director. Clinic-B has some leverage, and can insist on compliant behavior.

Clinic-B has 20 providers including pediatricians. 11 of these are Clinic-B partners, 9 associates. They operate out of 4 sites.

The Process
The patient is seen by PCP, when possible. Many providers have completely full schedules and are hard to get time to see. It is considered important with all patients, but particularly for those with suspected lumps, to respond to the patient as soon as possible, psychology playing a huge role in the treatment and approach. If the PCP is busy, the patient will be seen by another doctor, a nurse, or a physicians assistant. The patient makes the choice of whether to wait for their own PCP to have time, or see someone immediately. Usually the patient chooses to come in sooner rather than later. There is an assumption within Clinic-B that there will be full communication back to the PCP.

If the patient feels she needs to speak directly with her PCP, a time is set up, the chart called for, and the call completed.
Clinic-B has its own mammogram facilities at one location. HMO patients are required to use this facility (though there is "always an exception to be granted"). If "medically justifiable" anything can go outside of HMO rules.) Most FFS patients choose to be seen at the main site as well, though they can go anywhere. Joe has not noticed any issues regarding report return time lags.

On the bill for each visit, the doctor checks what tests were recommended. This in turn generates a corresponding report form, indicating that Clinic-B is awaiting the results of the test. The file goes into a "pending file" until the actual hard copy of the report is received. At this point the hard copy goes into the inbox of the PCP. One (small) timing hang up could be the time a report remains in the pending file waiting for a secretary to complete the process. The pending file is checked regularly. If a report has been outstanding for 2 months, a call will be made to the patient to see if the patient chose not to have the mammogram done. Occasionally, but rarely, the report has gotten "lost in the system"

Clinic-B has only a 5% turnover rate so the problem mentioned at Clinic-A does not hold true. If a patient transfers locations/insurers/providers, they have to request that any old records be sent to the new site. They usually do not request images, but rather only written reports. So for these transferred patients, there may not be an old mammogram with which to compare the new. Joe raises the question however of does this really make a clinical difference? In the long term care of a patient, if something is missed due to not having an old film, will it matter if a patient waits a year or two to have 2 images to compare?

There is a lump. Clinic-B sends the patient to a surgeon, with mammogram in hand. The surgeon recommends what step should be next. For HMO patients this is called a restrictive referral, as only the diagnostic visit is approved.

After a lump is detected, it will usually be aspirated, to determine malignancy. Many cysts are actually benign. Note: At Hospital-1, "interventional radiologists" are trained to perform and read the mammogram, and immediately do the aspiration, a more efficient mechanism than requiring two separate steps and visits as is now required. It could be done in just one step, more efficiently and a cost savings. The debate has been opened within Clinic-B which would be a better model, the decision likely being business driven. (i.e. does Clinic-B want to lose the revenue it currently receives for performing mammograms?)

PCPs are informed of all admissions to the hospital. The admissions often phoned into the office. The agreement with HMO-1 includes guaranteed paperwork about all patients. Pre-op work is done at Clinic-B for the most part. It is the PCPs personal choice whether or not to visit the patient in the hospital, with the exception of complex cases with additional co-managed problems. The PCP receives all operating room summaries, pathology reports, etc.

The tumor board at Hospital-1 looks at all patients cases and makes a recommendation about treatment plans. The surgeon normally is sitting on the tumor board as decisions for his or her patients are made. The surgeon then has the responsibility of implementing the treatment plan, or referring the patient to someone else for a second opinion. The PCP is nominally responsible for post-op care. One gap: It is unclear whose responsibility it is to make certain the patient hears and understands all of the options available.

After the treatment plan has been determined, the PCP and the surgeon take joint responsibility for getting the recommended referrals arranged. With HMO patients, it is expected the PCP will have a role in the care of the patient, where as for FFS patients this is not true. FFS patients usually have all follow up care done outside of Clinic-B, with most of the responsibility falling directly on the surgeon.

Protocols
There are treatment guidelines released by HMO-1. These guidelines are considered to be non restrictive, recommendations. These standards do contribute to changes in clinical practices. Clinic-B does not want to have 2 different sets of patient treatment and practice standards, so the processes established for HMO-1
patients tend to carryover and be utilized on all patients. This may result in patients who are in a position to choose not hearing all of the options. (patient autonomy related)

The incentives under capitation are to minimize, and this carries over to the FFS patients as well, with a current prejudice against marginal medical procedures. Joe would like to think that the guidelines released by HMO-1 are outcomes related.

**Miscellaneous**
Most patients are seen at the same center all the time, so their charts remain at the single location. If needed, courier services are used to deliver charts between the 4 locations. There is often a problem locating charts.

Clinic-B has a minimal computer system. Appointments are live, they are "going to get" lab results on line. They are moving in concept to an on-line medical record, but that is "5 years away".

HMO-1 provides incentives for performance of mammograms. There is a way to earn bonus money on top of capitation contracts. There is a list of screening tests, for which if Clinic-B performs them on 90% of all eligible patients, Clinic-B will receive the bonus.

HMO-1 audits the performance of Clinic-B. They track members, distribute and collect member satisfaction surveys, and audit records. This allows them to keep track of Clinic-B specific practice norms and standards.

The largest difference in HMO vs. FFS patient care at this point involves large cases. If a patient is quite sick (e.g. patient is disfigured, needs home care, etc.) the management of the case can be complex. A "nurse case manager" who works at Clinic-B but is funded by the HMO, is put in charge of the case, and coordinates all of the appointments, transportation, etc. It is a cost cutting device the integrates the care of patients across providers. The nurse case manager make sure insurers are all meeting common objectives, and that no more or less than the treatment plan is being conducted. For FFS patients, a social worked at Hospital-1 can be called in to do some of the coordinating and case management, but most FFS insurers pay for limited visits with these social workers, and the patient is eventually left to manage their own care.

**Interview: Primary Care Physician, "Joe"**
**Location:** Hospital-1
**Date:** 11 March 1995

Joe is a primary care physician at Hospital-1, a general internist. It is his opinion that the health care industry today is a "very fertile ground waiting to be mined." Joe has lost hundreds of patients himself. (He is not a member of a group and does not see HMO patients.) He has had to advertise in the paper. If the current trends continue, there is a distinct possibility of extinction. The current system is irrational and unstable. Things will change within a year or two. The only way to survive is with a niche practice.

As an example of some of the current issues, Joe provided the following example. (NOT a real patient case.) A 46 year old woman has breast cancer. The lump was found during a routine mammogram, she had a lumpectomy, and was recommended for post-op radiation. The question: Her nodes are negative. Should chemotherapy be entertained as a treatment solution? The case is presented at the tumor board, where the consulting oncologist recommends the patient receive chemotherapy. It is recognized that the patient is at high risk, and 5% of such patients will benefit from the additional chemotherapy. The patient is referred to an oncologist at Hospital-1 to receive the chemotherapy. This should be a joint decision, with the patient involved. There is only a 5% chance that patient will receive additional benefit from this treatment.

Moral: The patient is at the margin. The patient "might" see a difference. Obviously there is a cost difference. The clear benefit is at the medical margin. Joe sees there being a lot of issues arising from such cases.
On principle Joe does not like the whole approach of discounted fees. It is flawed. The system should be payer driven. Right now employers are in the drivers seat. They want to call the shots and reduce costs: you can’t blame them. Historically the system was set up like this arbitrarily. In the W.W.II price and labor contracts, health care coverage was provided as a means for employers to compete for employees. Now the whole system has gotten too expensive. To address this problem, employers need to control costs.

What is it about health insurers that is so different that patients shouldn’t be able to choose for themselves, as they do with house and car insurance? It is an anomalous situation from the market point of view. It all goes back to the tax codes, a break being given to the employers. Individuals can only get coverage if the employers pay and choose the insurance companies. The solution is not a single payer driven system, like they have in Canada. “Go from the frying pan into the fire with this system.”

We need to go from a payer driven to a patient driven system. We need to re-empower individuals to buy their own insurance, choose with whom they work. Give individuals the tax break directly. It is simple, and could be done by rewriting the tax code. The system would see shifts, re calibrations. HMOs will not go away.

Other insurance plans and companies would crop up if so directed by individuals. For example, catastrophic insurance plus a health care savings plan.

Practice patterns have changed over the past several years due to the evolution of sciences, not HMO practices. Quality of care issues are subtle. Joe sees hardly any healthy young people, they are being seen at the HMOs. Most of his patients have physical and/or emotional problems. When bad things happen to a loved one, a parent dies early, the patients need a lot of attention. They would have a hard time at an HMO. The relationships are simply not there. It can be hard to get in to see a specific provided, the appointment often taking months to schedule.

**Interview:** Director of Rehabilitation Services, "Mary"
**Location:** Hospital-1
**Date:** 12 March 1995

Very few breast cancer patients are seen any more. She is not sure why, as there used to be many more. Mary believes the surgical techniques are so much better that many more post op patients simply do not require therapy. Breast reconstruction is also occurring in the same surgical episode, doing an immediate muscle transplant after the removal of the breast. These patients have to be immobilized for a period of time, and can not begin to work on range of motion right after surgery. It would be too painful. They do see a few patients on an outpatient basis, though it is a very small percentage of the actual procedures done.

There are new related maladies presenting themselves that are currently drawing attention. Lymphedema is a problem that can develop many years later. It can cause serious problems, with support groups forming all over the country. Massage techniques are currently viewed as one of the most effective treatment methodologies. The problem is, the training takes 4 weeks of off-site training, and no one at Hospital-1 can afford to take that much time away from the institution. And it costs a lot. The result being they must continue to use known techniques, "the pump". Less than ideal.

There are differences in the way RS (rehabilitation services) must treat patients in general, different ground rules for every insurer. At the hospital where Mary previously worked, each and every patient was seen post op, while still in the hospital. The therapist would provide any relevant recovery handouts, instruct the patients what to do at home and provide training if needed. This does not occur at Hospital-1.

The ground rules: What insurance company do you have is the first question asked of every patient. The answer dictates entirely how you are handled, how the appointment is booked. Some patients required pre-approval, some can have one visits, some multiple but limited. "We have to be psychzophrenic". There are 5
main HMOs with whom they are used to dealing and have learned the "rules", with another 5 or so not seen as frequently. It "always seems a bit fuzzy".

As the insurers change their rules, Hospital-1 does not receive adequate notice. For example a changed fax number, a change in the number of visits a patient may have, etc. It appears as though the insurers are doing whatever they please, almost arbitrarily. Hospital-1 has no choice but to comply.

Patients do not know the fine print. Managed care puts impediments in the way of getting care. They make it difficult on purpose for patients to be seen, hoping that many patients simply won't bother to seek outside care. Therapists are concerned. In order to get any sort of extension of services to be covered, they must send the insurance companies confidential patient information regarding the patients health, indicating why the patient needs more visits, how far they have progressed, etc. The companies won't pay without this information, and there are serious concerns about confidentiality issues. Even the writing style of the request can effect whether or not authorization is given.

One thing they watch out for is patients demanding and getting therapy they do not need, for example industrial accident patients.

An example of a problem with the current rules: An HMO-2 patient is in a car accident and gets whiplash. HMO-2 allows 6 visits over 60 days. If Mary sees the patient twice a week for three weeks, she could probably get an extension for additional visits approved. The response to requests usually takes 24-36 hours to receive. But, all visits MUST be completed within 60 days, no payments provided after that point. This is a problem in that many injuries take longer than 60 days to recover. In addition, "for your lifetime" this is the only time the insurers will pay for treatment for that injury/diagnosis. "You are not allowed to come back for the same diagnosis in your lifetime". So patients are out of luck if they have a chronic problem. Also, future injuries or accidents can aggravate old problems again, but the treatment will not be covered. There is one exception, Medicare, which allows treatment if there is documented medical need.

Physical Therapy has been abused. Twenty years ago it could be provided only by prescription from a doctor, with specific instructions as to what services should be provided. Now it is seen as a consulting service, a series of goals and time frames. It has been seen as a dumping ground, a dead end in the treatment cycle. Previously therapists couldn't stop treating patients who had doctor prescriptions for services even when they knew the patient no longer needed treatment. Now the therapists themselves are setting the limits, doing the policing themselves. It is still somewhat arbitrary however.

**Interviewee:** Radiologist, "Joe"
**Location:** Hospital-1
**Date:** 12 March 1995

The patient contact begins with an abnormal mammogram. There can be either a cluster of atypical calcification or a peculiar shape density in the image. The next step is to do a localized or a directed needle biopsy. This can be performed by either a radiologist or a surgeon.

In the operating room, a frozen section is sometimes performed. This provides instantaneous results. Hormonal assays sometimes require that a frozen section be performed. This allows a test to be done to see if the sample is estrogen or progesterone sensitive, which will effect future treatments. If this test is requested by the oncologist, a sample is sent out to a lab on dry ice immediately. For most patients though a frozen section is no longer done, but rather a "paraffin block" test. (Which test is performed depends entirely on who the oncologist is, an interesting fact, since most oncologists do not enter the patients life until after the biopsy results come back positive. So in reality it is the radiologist or surgeon who determines which tests are to be conducted.)
The radiologist then runs a diagnosis, based on certain criteria. (e.g. does the section go to the margin, is there a high myopic count, is there an unusual size.) The results are sent to the surgeon, who makes the next decision. Should the lump be re-excised? Should Radio therapy be provided? The surgeon and the radiologist go before the tumor board with their results and suggested next steps. The tumor board meets weekly.

Joe never knows anything about a patient's insurance status. His practice has been in no noticeable way affected by HMO's.

Hospital-1 performed 227 mammographic biopsies last year, and increase from 18 in 1983. 26% of the 227 were positive. Mammograms are almost always done, even if there is obviously a large mass felt by the provider. It provides both a baseline, and a look at the other breast.

**Interviewee:** Principal Research Scientist, "Joe"
**Location:** MIT School of Architecture and Planning
**Date:** 13 March 1995

Joe is looking at the design of the surgical room for the 21st century. He expects that the project will lead to virtual environments for designing and using multi-media applications. Presently, much of the costs of surgery are tied up in the physical plant and it is poorly laid out at best. His project is looking at how to better design the room and integrate the efforts of management, economic planners and health care providers.

They want to build a virtual environment to simulate a real environment. Joe wants to design a system to change behavior by showing planners the big picture. In medicine, surgery has been a symbolic center and very profitable. This is becoming very expensive for hospitals. This new tool will provide an integrated approach to keep costs low and quality high.

A barrier to acceptance of this structure include the fact that management of medicine is moving away from doctors and more toward managers. Another barrier is that capital investment will be tremendous.

Clinton looked only at an economic model and did not look closely enough at environmental quality and other factors. He opened a Pandora's Box and did not close it, because he couldn't.

**Recommendation:** Process handbook will not be read unless the handbook is a tool. It should be used for training and should be well worn. You might consider something that could be held in your hand.

Corporate membership is very influential. Getting doctors' time is difficult and they must be compensated. Little NIH money is being put into researching how to develop guidelines and protocols, and actually conduct research. There is much confusion as to the definition of good health.

He agrees that physician's incentives will be a key issue.

**Interviewee:** Surgeon, "Mary"
**Location:** Hospital-1
**Date:** 3 April 1995

**Miscellaneous**
She is very interested in what "the process" looks like according to our findings. Her guess is it is very different from what her perceptions are (of what happens to a patient before they actually get to her.)

Mary is in solo practice at Hospital-1. She can choose with whom she wants to contract. Many of her contracts are with organizations like HMO-2, who have a fee schedule, "take it or leave it." It is getting harder
and harder for her to remain solo however. A lot of the nice things in medicine are lost in group setting though. There is no longer the concept of "my doctor", patients arrive saying their PCP is Dr. X but they have never actually even met Dr. X. Continuity of care is flushed, it becomes more of a business. This is OK if there is a public re-education. Levels of expectations of patients need to be established ahead of time. For example, telling patients they may go home the next day vs. in three days. They have to educate patients that they should no longer expect to stay in the hospital forever.

The Process
A patient has been told that she has a lump or needs a biopsy. It used to be the case that radiologists were not present when mammograms were taken, resulting in a several day wait for the image to be read. Now there is a radiologist in the mammography center from 9:00-4:00. The image is read immediately, and if an additional test is required, it can be conducted at with the patient still present. It prevents the patient from having to come in multiple times, and has significantly reduced patient hysteria levels.

This is true at Hospital-1. Some of the HMOs do not use the Hospital-1 facilities however, and these patients do not benefit from the above convenience. These patients hand carry their mammograms to Mary, as if the images were requested from wherever they were performed, more often than not they either did not arrive, or did not arrive in time for the patients appointment, regardless of how far in advance they were ordered.

Mary goes over the mammogram with the patient. She takes a medical history. Prior to the visit, a form is sent to the patient regarding medical history, which takes about 20 minutes to complete, and which the patients are asked to bring with them to the appointment. Mary goes over why a biopsy has been recommended, examines the patient, and goes over the procedure she recommends. The extent of the problem and the hysteria level determine when the procedure is scheduled. It is almost always within 2 weeks at Hospital-1, although Mary aims for 1 week. Only occasionally is the time frame longer. Patients get their blood work and pre-op testing done ahead of time. Mary office sets up all of the required appointments for the patients.

Frozen sections of the biopsy (see pathology interview) can be done immediately in the operating room. Mary does not usually choose to use this method however, preferring the paraffin blocks. The frozen sections tell you whether or not the patient has cancer, period. There is no information provided about the size, type etc. In addition, if a patient has micro calcifications rather than an explicit lump, there is nothing there to quick freeze. She can get the results of the tests back within 24 hours usually. Patients are told that they will hear within 48-72 working hours, and Mary aims for 48. All tests are double read. The pathologist makes the initial assessment. Then every case is reviewed in the department slide show, where all members of the pathology department are present. This occurs before the final report is issued. Mammograms are also double read. In both cases, if a question remains, the results may be read by yet a third expert.

If the results are "bad", i.e. cancer, she has usually had a feeling about it before hand. In order not to alarm the patients, she will simply tell them "why don't you come into my office in three days to discuss the results", allowing the appointment to be set up ahead of time, and eliminating the need to make a phone asking the patient to come in. She tries not to tell people the results of a positive test over the phone, although sometimes it is unavoidable. She tries to see all patients within 24 hours of receiving the results.

A metastatic work up is completed. She and the patient talk to an oncologist and a plastic surgeon to discuss the options. Some of the older patients, or repeat procedure patients already know what they want to have done, and do not see an oncologist until after surgery. The choice is the patients. These appointments occur within 1-2 weeks. The patients proceed, get a second opinion or go elsewhere. She will get a referral where required for anyone wanting a second opinion. Patients do not get short changed because of their insurance status. She will call and argue on their behalf.

HMO vs. FFS
Certain HMOs are restricted. Right now most of her patients are seen at Hospital-1. There was a period of time when patients from Clinic-B had to see Oncologists at Clinic-X, due to contractual obligations. It
manifests into a control issue. Mary feels she can get it done more efficiently if her office arranges all the appointments and plays coordinator. This does not effect clinical procedures.

The onset of managed care has resulted in Mary and her staff having more paper work, more phone work, more arguing. They have to get prior approval for almost everything, are frequently left on hold for long periods of time when they make the required phone calls. They are often given the wrong information over the phone. She has contracts with 65 different insurers, and each wants something different. Just keeping track of them has been more work. While no one on her staff is specifically appointed to handle all of this work, if it did not need to be done, one of them would not be required.

Many of the HMOs pay now with a global fee, covering the procedures and all of the related appointments. Traditionally Mary spends between an hour and a half and two hours with patients in conference in her office post op. She has had to cut down on the amount of time she now spends with them. "There is only so much you can do for free." The HMOs no longer pay her for this time. She is trying to ignore the financial aspects of this arrangement but is finding it harder and harder to do so. She has had to change her practices. She and a nurse now see the patient initially, then Mary leaves the room and the nurse completes the visit.

Quality of care is the same. She may not be able to keep patients in the hospital as long as she would like in all cases. In actuality, it is the doctors mental health that is suffering from the new restrictions.

She is concerned about many of the procedures previously performed in a hospital that are now being performed in clinic settings. The personnel are often not adequately trained, and do not have the resources available to them should there be a problem.

There is an inherent conflict of interest in the managed care world. Where are the $ going? There is a shift from the providers to the insurance companies and CEOs. HMOs are given the incentive not to do things. For instance, even if permission is given for a patient to receive treatment, it is often money that the HMO will have to part with if they actually refer the patient to a specialist. If the referral is not made, more money is kept by the clinic, to be split and pocketed internally. Most people are still morale and good and will not allow this to happen, but it is real and legitimate concern.

There are some legitimate abuses of the system. There are real ways to cut costs. There are some difference in treatment based on HMO restrictions. For instance, the American Cancer Society recommends that patients between the ages of 1 and 50 have a mammogram done every 1-2 years. Most HMOs and Medicare only pay for every other year. Mary recommends to her patients in this age bracket that they have the test done every year, but many can not do to insurance. She also sees many young patients. Many HMOs will not pay for the first mammogram until 30 or 35 years of age. She feels that the first should be done for those patients whose mothers had breast cancer not later than 10 years prior to the age of mothers onset, i.e. mother is diagnosed at age 36, daughter should have mammogram at 26. HMO coverage will not permit this to be done.

There has to be a happy medium. Critical pathways are not the way to go. The emphasis now is getting people out of the hospital faster, quicker. Often this is too short, "crazy". The patients are moved into sub-acute centers. What happens to continuity of care? Who follows the patients? If another doctor takes over treatment, Mary is still indirectly held responsible for the overall outcome of the patients care, even though the patient is no longer directly under her care. The mechanisms of coordination are simply not in place. How will the patient get from one place to another? Who will take care of them once they get there? What if there is a problem? None of these questions are being addressed ahead of time. And the results are not yet in. If a patient moves to sub-acute and has to spend 2 weeks, is this really cheaper than a week in the hospital itself would have been?

With Critical Pathways, clinicians are losing say in the treatment of the patient. Mary is trying to break down the list of treatments further than is currently the case: Acute, sub-acute and home with services care. Criteria for a certain method of treatment should be different for each of these cases. Mary is currently looking at
critical pathways set Hospital-1 is thinking of purchasing from a company in Texas. These companies make their recommendations based on outcomes databases.

"One starts and the ball gets rolling". If one HMO decides to change a policy or practice, others usually quickly follow suit.

It is a catch 22. Managed Care does not dictate medical care, but rather financial compensation. It an insurer recommends she send someone home early, and there is a problem later on, Mary is held liable, "You did not HAVE to send the patient home". She has had to start documenting, everything. She has to make the decision herself each time. It has effected the doctor-patient relationships, as many patients blame the providers themselves. Often a doctor now has to defend him or herself. "Why if the patient still here if they can tolerate liquids?"

Often the insurers are going off of computerized "check off lists" in order to determine what they will pay for: Does the patient have X? Is Y true? An approval is granted or not. Mary has argued with people on the phone who had absolutely no clinical background. "But you said X was true, and my list says that if X then Y."

If medical practices are going to be changed, the system to do so needs to be in place first. The facilities and trained personnel need to be in place. You can not tell doctors "no" without providing them with viable alternative and backup.

Interviewee: Radiologist, "Mary"
Location: Hospital-1
Date: 13 April 1995

The radiologists perform three basic functions:

- Screening: no suspected cancer, routine mammograms done every 1-2 years;
- Diagnostic/evaluative: a palpable lump or breast pain has been detected, cancer is suspected. A mammography will be performed. Occasionally an ultrasound guided biopsy will also be performed.
- Ongoing follow-up: Regular mammographies done post cancer treatment.

The Radiologists always participate in the diagnosis of the patients. Often they will even localize the cancer on the day of surgery so the mass can be removed by the surgeons. If a patient actually does have breast cancer, the radiologists are involved in "staging" (prepping) the patient, as far as imaging is concerned. If a patient is referred to her by an oncologist this is usually a full work up. If the referral comes from someone else a more limited staging is conducted.

Radiologists are always involved in the ongoing care of a patient, post cancer treatment. Mary never know what insurance company a patient has when she is treating them. If cancer is found, the patient is asked which insurance company they have, as there may restrictions as to which surgeon Mary can send people. The PCP is always called prior to selecting a surgeon. An effort is made to let the patient know exactly what the next step is going to be before they leave the radiologists office, so there is no waiting period. Mary can often get through to a surgeon's office more easily than the patient herself, and thus often sets up the appointment with the surgeon before the patient initially leaves her office. The facilitates continuity of care. This practice came about independent of HMO approval restrictions.

All images are read by 2 radiologists at Hospital-1. All patients are treated as though there is something wrong with their breast when they walk in the door. It is Mary's opinion that Hospital-1 has a high breast cancer rate. They look very hard, aggressive performing biopsies. There is a performance "scorecard"
There is a basic problem with referring patients for mammographies overall. There is a basic misunderstanding of the risks and potential benefits that accrue in a patient population with regular use of mammographies. With the exception of one year, each year since 1981 Hospital-1 has seen more women in their 40's with breast cancer than any other decade. Popular press negatively drives medical care, limiting mammograms. Improvements with preventative medicine attempts are noted, but it is still not enough.

The treatments provided at Hospital-1 is good. The community is small, and the relationships between Hospital-1 and the participating clinics (such as Clinic-A) are good.

There seems to currently be some concern about patients not being seen at the tumor board. Mary heard through a surgeon on staff at Hospital-1 that one of the major HMOs was no longer going to pay for patient cases to be presented at the tumor board. The cost per case is approximately $100. This is a positive program, where controversy is encouraged, and multiple opinions solicited. All cancer patients are eligible to be presented. All the consultants are there together (radiologist, oncologists, surgeon, PCP, etc.) and patients are full represented.

**Interviewee:** Manager of Member Services, "Mary"

**Location:** Outpatient Medical Clinic-A

**Date:** 19 April 1995

Mary is the Manager of Member Services. She works only with HMO-1 patients. She is located at Clinic-A and is paid by Clinic-A as well. She is essentially a patient advocate, helping patients use managed care. She offers orientations, explains services, investigates and explains claim rejections, etc. There are 5 staff members in Member Services, "customer service". The department has been around for 7 or 8 years.

There is a member advisor on every floor of Clinic-A. They handle many of the referrals themselves, though Mary sees the overflow. A PCP sees a patient. Sometimes a referral is needed immediately and the PCP will call Mary, who will get the necessary authorizations. In less urgent cases, the PCP may write a note requesting that a referral be made, or may send the patient directly from the PCP office to the Member Services office. Yet other times a patient themselves will call from home, for instance indicating that it is time for their annual mammogram, and could Clinic-A set it up? The patient does not need to see the PCP. Mary will complete the referral request form and send it to the PCP for final signature. If the PCP denies the referral, he or she will call the patient directly to determine an appropriate care plan or alternative.

Mary determines whether or not a referral can be made. She examines the patient chart, and uses the HMO-1 benefits guidelines book to make many of the determinations. (For example, mammograms are OK annually for women ages 40-50.) If there are any questions regarding coverage, HMO-1 is called. For instance, a call was placed today to the HMO-1 pharmacy to determine if a particular steroid for a patient would be covered. Such phone calls are made many times a day. It is still true though that for most patients, no contact with HMO-1 needs to be made. The referrals are sent to the patient, who will call the appropriate specialist (at Hospital-1) for an appointment. All referrals are entered into the HMO-1 computer.

Authorizations are done at Clinic-A, by Clinic-A. HMO-1 indicates whether or not they will pay for a particular procedure or treatment. It is still up to Clinic-A as to whether or not they will give approval. For instance, in the case mentioned above, HMO-1 indicated they would not pay for the drug in question. But a patient advocate at Clinic-A determined a way for Clinic-A to cover the costs themselves under capitation. Clinic-A knows essentially then everything that happens to the patient. It is mainly for tracking purposes, is everything approved.
There are also 5 people employed at Clinic-A to cover managed care billing. Member services is responsible for primarily referrals. They handle well over 1000 referrals a month. Under managed care "patients know that everything is taken care of." They come to Mary to see if everything has been approved, and usually never see a bill. Particularly for patients with cancer, or breast cancer, it is one less thing they need to worry about.

**Case Managers**
Case Managers are clinicians, usually RNs. They come to Clinic-A daily, following rounds at Hospital-1. A PCP can indicate that a patient needs to be "on case management". A patient can also request it, as can Mary. It is then determined whether or not case management is appropriate for this patient. Case managers handle much of the patient and family contact, and issues such as "after care". Mary provided me with the names of a couple of case mangers with whom I can speak.

**Billing**
Clinic-A is paid a monthly capitated fee for each patients by HMO-1. If a patient is sent to Hospital-1 for a mammogram, Hospital-1 bills HMO-1, who cuts a check and settles the bill. This amount is then deducted from the capitated fees Clinic-A collects from HMO-1 the following month. All bills are entered into the HMO-1 computer. HMO-1 pays for all inpatient services, all else comes out of the Clinic-A capitation amounts.

**Interviewee:** Director of Finance, "John"
**Location:** Outpatient Medical Clinic-A
**Date:** 20 April 1995

John was contacted to confirm the billing process as we understood it, and was able to map out for us the simplified version of the billing process. Clinic-A receives a monthly fee for each patient, capitated payment. Suppose the patient has a mammogram done at Hospital-1. Hospital-1 bills Clinic-A directly. Clinic-A then enters this billing information into a computer (HMO-1). HMO-1 actually cuts the check and pays Hospital-1. The cost of all such referrals is then deducted from future capitation payments from HMO-1 to Clinic-A.

**Interviewee:** Surgeon, "John"
**Location:** Hospital-1
**Date:** April 21, 1995

John is a member of the Hospital-1 Tumor Board. The meetings are held weekly and last an hour to an hour and a half. Between three and six cases are presented at each meeting. Members are faxed a few days prior to the meetings all of the relevant patient information, so they arrive at the meetings prepared. Often they will have already discussed the case with their colleagues prior to the meeting. In this case, a note is dictated and placed in the patient chart, indicating that such discussions transpired. (Note of interest: At one point in time patients were allowed to attend the tumor board meetings. It was often difficult for them to understand all of the clinical language and to assimilate all of what they were hearing. This practice has been stopped.) Such a board is fairly standard in health care today across the nation. The Commission on Cancer and the American College of Surgeons have standards for such boards, such as which specialties need to be represented (oncologist, radiologist, radiation therapist, and pathologist.) What makes the Hospital-1 board unique is that it includes members from outside institutions. This practice started historically, when Hospital-1 itself did not have certain specialists under its umbrella, and invited these outside representatives in order to complete the circle of expertise being drawn together.

HMO-1 is unique in submitting a charge to patients for this service. And recent rumors indicate they are considering no longer paying for this service. Are they being penny wise and pound foolish? This is consistent with much of recent practices. They look at charges, and don’t think about what they really mean, what the real repercussions of cutting costs might be. For example, look at orthopedic surgery. Dr. A charges
less to do a procedure than does Dr. B. So the decision is made to use Dr. A for all of the HMO-1 patients. What they do not see is that Dr. A takes 5 times as long to perform the surgery, and since the operating room charges for patients by the minute, in even the short run, money is being lost. Charges are being examined individually, not in the aggregate.

There are many benefits to the tumor board. There is a medical-legal protection issue. Following a case presentation at the tumor board, a note is put in the patient's file reflecting what transpired, including multiple opinions and why one was finally selected as the recommended treatment plan. The legal question "why didn't you do this?" is answered, and the responsibility shared by a group of providers, not a single practitioner.

The board is composed of representatives from multiple specialties (radiology, oncology, surgery), as well as multiple institutions. The meetings can almost be considered working conferences. Bringing together such a wide variety of specialists is added protection for the patients. All options are considered and discussed. Throwing around ideas is the purpose of the case presentations and meetings. It is professionally beneficial to the members. A variety of opinions are discussed for like maladies. New practices are discussed. Differences between the practices at the participating institutions are discussed. It is a great way for those involved to remain up to date on practices and treatments.

Patients appreciate the board. Where else could they get the opinions of world famous practitioners? Particularly at such a cheap rate. Expensive? To get the same number and value of opinions as are received at a typical meeting, a patient would have to go see 3-4 oncologists, several surgeons, multiple radiologists, etc. The individual fees for each of these visits would be astronomical. The participating hospitals charges Hospital-1 for the time of its participating specialists. Hospital-1 in turn must try to somehow recover these costs, and thus charges the patients. As this is considered to be a valuable service to all patients, as well as to the specialists treating them, Hospital-1 will likely continue to convene the board, even if HMOs such as HMO-1 stop payment for the service, somehow swallowing the cost themselves.

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**Interviewee:** Oncologist, "Joe"

**Location:** Hospital-1

**Date:** April 24, 1995

Joe's role in the treatment of breast cancer varies widely depending on the patient. 80% of the patients he see come to him with a positive biopsy with a finding of malignancy. Others come on their own volition with a breast lesion, and don't feel the normal treatment cycle (primary care physician [PCP] to radiologist, etc.) is adequate. A third type of patient seen are indigent patients. The Department of Public Health and the Center for Disease control have given a huge grant to Hospital-3, where Joe practices part time. Indigent women can receive free mammograms, and he will see them if it is then felt that an evaluation is required, or a question needs to be answered.

The medical oncologist tried to help the patient determine the primary intervention. The PCP contacts the oncologist right away when a positive biopsy is received. This contact is almost always made by the PCP. There is a huge patient anxiety level, and there is the desire to thing rolling and completed as soon as possible.

Joe performs a formal consult, which is generally booked for an hour. It usually lasts more than an hour. There is an amazing amount of information being thrown at the patients all at once, and a lot of questions arise. Unless they have been to a surgeon who is knowledgeable about the process, this initial consult is often the first time the patient hears the options and alternatives. A physical exam follows the verbal descriptions. Often, discussing a single "loaded" issue takes up the entire visit, and the patients has to come back for a second visit to perform the physical exam.
The younger and more aware the patient, the more intensive is Joe’s approach. For instance, for some he will actually draw cancer cells for them, explaining graphically what is happening. He will describe exactly where the cells are in which stage of the cancer process, and where the patients cells themselves are.

At the end of this visit a recommendation is made. The hope is that the patients walk out with an understanding of the process, and have a solid recommendation from him as to what the best recommendation would be, or that the patient should get a second opinion. The visits are primarily for presenting information. These are stressful encounters, as people are hearing things they do not want to hear. It takes a great deal of energy and effort for all involved.

At Hospital-3 hospital it is the oncologist who decides on the course of treatment, whereas at Hospital-1 it is the surgeons. The Tumor Board is viewed as important component of the decision process. It is a consensus environment with strong input form experienced practitioners. Occasionally the patient and oncologist will disagree with what the Tumor Board recommends. It is still then between the patients and the specialist to make the final choice. There are sometimes ego problems that need to be side stepped around as choices are made and implemented.

HMOs may dictate whether a second opinion can occur, and if so where. It may restrict the options as to where chemotherapy and radiotherapy can be provided. There are not restrictions as to whether or not these treatment may be provided, only where and by whom. Occasionally, the specialist will put up a fight with the HMO, if for instance they fell the institution selected by the HMO to provide service is not good enough and they want the patient sent elsewhere.

Patients at Hospital-1 are not the same as the patients at Hospital-2. The patients at Hospital-2 want to be told what to do. The Hospital-1 population tends to be more middle class, well educated people, who want to determine and make their own decisions.

Things are rapidly changing. There is a tensions between the PCP and the medical oncologists growing. The Oncologists feel that they should actually become the PCP for cancer patients, as there needs to be someone familiar with the disease, it side effects, etc. working with the patient over time. This allows any problem encountered along the way to receive prompt, proper intervention. PCPs do not always “understand” the disease. This is occurring on a national level.

**Interviewee:** Case Manager, "Mary"  
**Location:** HMO-1  
**Date:** April 25, 1995

“We hear that the case managers at HMO-1 are unique, not functioning like most other case managers across the county.

There is an established trigger list of diagnosis published by HMO-1, of which cancer is a member. This list is distributed to PCPs, who are supposed to notify the case managers (CM) if a patient fits into one of the diagnosis. Some providers are on top of this practice, others are not. The CM will also hear from a member advisor at (for example) Clinic-A. OR, worse case scenario, is that the CM picks up the patient in house, in the hospital. Recently, there has been a run of young patients seen at Clinic-A. The case loads of the CM is huge.

They would prefer to see the patient before any procedures are performed or hospitalization is necessary. The goal is to talk to the patient about how they are going to function after the procedures, how they are going home, what to expect pre and post operatively, etc. The CM see the patient in the hospital, then conduct follow-up phone calls. For breast cancer patient, the CM frequently waits to place this phone call until the results of the biopsy if back from the labs, as this information is not always known before the patient goes
home. They talk to the patient about what the treatment plan is going to be. Ideally, the CM would talk to the PCP before making initial contact with the patients.

Follow up calls are made to malignant breast cancer patients, to find out what treatment plan has been selected. They can help the patient determine where to have the chemo or hormone therapies performed. Once the patient is hooked up with therapy, there is not much for the CM to do. They have a beeper, and the number is given to the patient, who are encouraged to call if they have any questions or problems. For example, the patient might need nupigen, a drug that it used to increase white blood cell production. It is administered on an outpatient basis, but it can be a challenge for the patients to get through to the pharmacies, clinics, etc. So the CM will handle the arrangements.

Once the patient is through the protocol, the CM is not usually any longer involved in the case. If time permits, the CM will make calls to patients after the fact, to check in. But there are so many other patients. For some, the CM has to intervene once or twice a week.

The primary role of the CM is to facilitate. They get the patient in to see the people they need to see or talk to. They get into more into more of the clinical issues than do the member advisors.

The patients seem to respond well to the service provided. For example, a patient needs a hip replacement. The CM knows because it is elective surgery and the surgeon contacts them to let them know about the patient. The CM will contact the patient, conduct a physical therapy pre-assessment, asking questions such as how many stairs are in your house, do you have someone to take care of you, etc. The contact is made pre-operatively, to determine how long the patients will be in the hospital, have they discussed rehabilitation options with anyone? The CM will then follow-up with the patient, essentially seeing them through from start to finish, addressing even issues of transpiration. Often the patient or the family just needs someone to think through the process with.

Discharge planners do a lot of this advising. But the pre-op contact with the patient and the CM does really seem to make a difference. The patient thinks about the issues ahead of time. Often the patient does not even know what the issues are when they enter the process.

The CMs are on site in the hospital and see the patients while they are there if at all feasible. Being actually physically present is important. This service and contact does not really exist with fee for service patients.

Communication with the providers is catamount. Member advisors are key. They will for instance provide CM with the names of "frequent flyers", patients who either come in a lot or call frequently with questions. The CM may actually perform a home visits.

Doctors do not always use the CM service. They simply forget, or it is just another phone call they need to make. But they appear to be delighted with the service and the results it provides.
APPENDIX D

INTERVIEW QUESTIONS

Opening Question:

1. Tell me what you do in your job!

Questions about processes:

2. Can you tell me what the activities you engage in?

3. Can you tell me what activities make up this process?

4. What deadlines do you have to meet?

5. What paperwork do you encounter in your daily work?

Questions about activities:

6. Who performs in this activity (e.g. actors)?

7. What are the goals of this activity? What are you trying to accomplish?

8. What are the goals of the various departments or individuals engaged in this activity?

9. What forms, reports, or other paperwork must you complete or have available to complete this activity?

10. What forms or reports does this activity produce?

11. What else (e.g. product prototypes) does the activity produce?

12. What contextual factors are of critical importance to completing this activity (this includes issues, problems, exceptions, key performance measures, incentives, or interdependencies).
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