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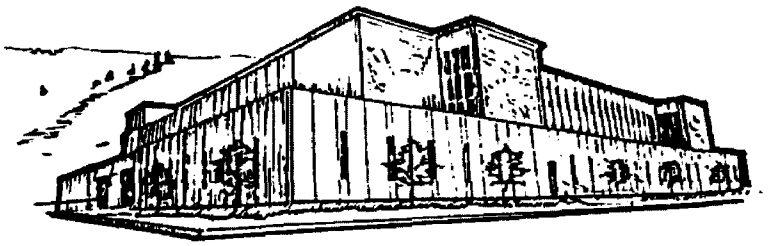
Product line management for hospitals : literature research and feasibility study for St. Patrick Hospital Missoula Montana

Thomas A. Wozniak
The University of Montana



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PRODUCT LINE MANAGEMENT FOR HOSPITALS

LITERATURE RESEARCH

AND

FEASIBILITY STUDY

FOR ST. PATRICK HOSPITAL

MISSOULA, MONTANA

by

Thomas A. Wozniak

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Approved by:

Gerald E Evans
Chairperson

C C Murray
Dean, Graduate School

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I. INTRODUCTION

Hospitals have historically been organized around functional lines. The hospital organizational chart typically contains several departments, each directed by a department manager, with administrators responsible for each division. Hospital divisions include direct patient care services (nursing and other professional services), support services, and financial and information services. Each department is arranged as a complete cost center and operates under a departmental budget for revenues and direct departmental expenses. This arrangement allows for assigning responsibility for department performance to a department manager.

The implication of the functional structure is that by managing the distinct departments and functions of the organization, one is managing the organization. However, the product of the hospital is not the specific outputs of functional departments, but is the aggregation of products and services supplied to each patient under the direction of the physician. Products of a typical hospital may be viewed as the specific goods and services provided to each patient, including lab tests, x-rays, pharmaceutics, etc. In reality, these are merely intermediate outputs. The specific set of these intermediate set of outputs provided to each patient is the product of the hospital. Hospitals are multi-product

organizations with numerous products consisting of multiple goods and services. Therefore, a hospital's product line is potentially as extensive as the number of patients it serves [6].

Advantages of a functional organizational structure include allowing economies of scale by pooling resources, focusing on cost and quality of departmental outputs, and contributing to professional development and competence. However, disadvantages of the functional structure are becoming more apparent as the business of healthcare undergoes significant change. A primary shortcoming arises from lack of coordination between hospital departments, allowing territorialism by function and clinical specialty. And in extreme conditions, hospital departments may compete with one another and be reluctant to share information or scarce hospital resources. Hospitals have been characterized by some as collections of individual "fiefdoms" where departmental staff and physicians work to protect their power base. Traditional hospital organizational structure is not designed to provide a comprehensive focus on integrated services and can not respond rapidly to changes in the environment. The functional form reinforces different functional orientations and ignores the interdependence among the personnel in functional areas [5].

In recent years, hospitals have been faced with a rapidly changing environment, including a shift from cost-based reimbursement to various fixed reimbursement models. Prior to 1983, hospitals were reimbursed by the Medicare and Medicaid programs based on allowable hospital costs of providing services to patients covered by these programs. Medicare legislation and its related implementing regulations virtually locked in the functional approach for hospitals, with emphasis on cost centers and cost-based reimbursement.

In 1983, Medicare adopted the Prospective Payment System (PPS) which shifted reimbursement from cost-based to a fixed reimbursement system for in-patient services. PPS regulations established approximately 500 unique diagnoses, called diagnostic related groups (DRGs). Reimbursement was fixed for each specific DRG and each patient was assigned only one DRG upon discharge. The rationale was that hospitals that were more cost-efficient in provision of services would benefit by being allowed to keep the excess of reimbursement over cost. Likewise, inefficient hospitals would be forced to make changes in order to remain profitable. However, because of government payment constraints, hospital reimbursements have not kept pace with costs. While Medicare's payment rates to hospital have increased at 1% annually, hospital costs have increased 5-6% annually. Further, many private insurance companies, health maintenance organization (HMOs), preferred

provider organizations (PPOs) and other payers have adopted fixed reimbursement systems. Almost 400 hospitals have gone out of business since the DRG system was implemented. It is estimated that another 700-1000 hospitals will close over the next few years [1].

In addition to reimbursement pressures, hospitals are experiencing other environmental changes. Patients are being encouraged to take greater responsibility for their care. In response, hospitals have attempted to become more customer focused. A typical hospital admission will cause a patient to interface with a large number of hospital departments from admissions to radiology, operating room, emergency department, nursing floor, laboratory, pharmacy, and eventually to the billing and collection process. Clearly, a hospital needs to coordinate its array of services to create an environment that has the customer as the primary focus.

These environmental factors are causing many hospitals to experiment with alternative management structures. The accounting firm of Ernst and Whinney stated in 1988 that achieving success for hospitals in the current marketplace requires "modification to the structure of most hospitals" [7]. The shift to DRG reimbursement has caused hospitals to think in terms of product rather than function [14]. One concept that holds promise is Product Line Management (PLM).

The potential advantages of this approach would be to reduce duplication, improve efficiency, reduce costs, and to create a seamless continuum of care that would be perceived favorably by patients.

PLM originated in 1928 when Proctor and Gamble identified the need to centralize all the information regarding specific products to optimize manufacturing and maximize profits [5]. Bowers and Taylor define PLM for hospitals as "the organizational structure, management control systems, and delivery strategies for health care services structured around case types or major clinical services" [3,18]. MacStravic defines a product line for hospitals as "a set of products that when planned, managed, or marketed as a group yields some advantage over being treated as isolated individuals" [14].

Under a functional approach, managers are responsible for functional activities such as laboratory, pharmacy, surgery, radiology, etc. No one individual is responsible for the performance of a specific product line [3]. Under a PLM structure, a single hospital manager would be responsible for strategy, resource consumption, production, marketing, budgeting, and results measurement of each particular product line in the hospital. Product lines are made up of the products or services provided by the hospital requiring the same inputs to produce, are directed towards similar

customers, and whose performance can be measured in terms of profit and loss [7]. PLM connects the basis of control with the primary functions of the health care organization. This is contrary to the traditional way hospitals are managed that mainly control the way departments function [9].

St. Patrick Hospital is a 213-bed tertiary care center located in Missoula, Montana. Unlike many other 200-bed hospitals located throughout the country, St. Patrick is unique in the array of services provided. Because St. Patrick is a regional referral center for most of Western Montana and Northern Idaho, the hospital offers many specialty services not available in hospitals of the same size. Services include acute in-patient mental health, addiction treatment, cardiac surgery, renal dialysis, radiation and chemotherapy cancer treatment, neurosurgery, orthopedic surgery, cardiac catheterization lab, a 24-hour fully-staffed emergency room, an air ambulance service, as well as various diagnostic services including CAT scan, nuclear medicine scanning, and magnetic resonance imaging (MRI).

Unlike primary care institutions, tertiary hospitals offer an array of specialty services that have the potential to be managed as product lines. As a tertiary referral center, St. Patrick hospital has the ability to identify discreet services that can be managed individually. This

paper will discuss the various aspects of PLM for hospitals and assess the applicability and feasibility of applying PLM concepts to St. Patrick Hospital.

II. OVERVIEW OF PRODUCT LINE MANAGEMENT

A. PLM STRUCTURE IN HOSPITALS

Product line management can be conceptualized as two distinct but related components. The first is the strategic orientation the hospital pursues. The second is the organizational structure put in place to carry out the strategic orientation. Charns writes that hospitals get into trouble when they fail to recognize the connection between the strategic and organizational components. For each strategic orientation the hospital pursues, there is an appropriate organizational structure and type of product manager [5]. After a hospital decides to implement a PLM management strategy, organizational structure must be evaluated.

The literature identifies several organizational structures present in hospitals. Janssen defines hospital structure along three lines. The first is "facility management" whereby the hospital is organized as a set of facilities operating on the behalf of physicians. The task of the hospital is to deliver facilities in the most efficient manner. The second structure is "function management" whereby the hospital is structured as a set of functions to be delivered by physicians. The third is "product management". Janssen defines product management as "a set of products that are related to each other by such factors as the type of need

they satisfy, the way they are used, the customers that use them, and the mechanisms through which they are marketed" [9].

According to Charns [5], the three most common management structures found in hospitals include (1) functional, (2) market management, and (3) product line management. All of these focuses can coexist at the same time in an individual hospital [5].

Patterson [19] also identified three models of PLM utilized in hospitals. The first is "market management". In this model, emphasis is placed on market surveillance. The goal is to identify needs and opportunities and the result is increased patient volume. This model involves the least threatening change to the existing organization. The second is the "distribution management" model. This model puts the primary emphasis on managing channels of distribution, primarily physicians and HMOs and PPOs. Again, the goal is increased utilization of hospital services. The third model requires the greatest change to the traditional hospital hierarchy. Under the model called "strategic business unit" (SBU) management, the hospital develops four to eight distinct business lines organized around clinical, operational, or market similarities, regardless of whether or not the service is provided in a hospital setting. Patterson believes that

this is the model many health care institutions will migrate to over time [19].

The term "product line management" has different applications in different hospitals. For some, it is used to refer to a general product/market orientation and may also be associated with the terms "centers of excellence", "service lines", "business units", or "management centers". In other hospitals, it is a general term referring to a product and market-oriented focus which can be accomplished using a number of different organizational structures. And for others, product line management refers to a fully decentralized organizational structure with separate and distinct business units organized as product lines.

Several authors advocate the SBU model for PLM in hospitals. According to Manning, product line management necessitates that the hospital be managed as a "portfolio" of businesses. Each of these businesses (SBUs), are designed to service the needs of a distinct product-market segment. The strategy of each SBU is to meet the competitive needs of the business unit, while keeping in line with overall organization goals. The portfolio should be designed to "achieve an overall corporate strategy by maintaining balanced sales

growth, earnings, and an asset mix with a controlled level of risk" [15].

Both Nackel and Bowers argue that each product line should be a separate and distinct "business unit" within the hospital. Each of these business units should be organized as a profit/loss center [3,18]. An important issue is the segregation of responsibilities according to who controls costs. In its true form, PLM calls for complete decentralization, giving the decision-making process to independently functioning product managers [19].

In the SBU model, top management is responsible for overall institutional strategic direction, setting financial policies and guidelines, and providing financial and human resource support for product lines. The product manager's role is for ongoing business planning, budgeting, and profitability management. The traditional clinical hierarchy is decentralized to the product managers. Services that can not easily be assigned to a product line will negotiate the cost of their service with the product manager [19]. For the purposes of this paper, PLM will refer to the SBU structure.

Choosing the right model, or combination of models, is a function of overall business strategy, specifics of the product line, skills and capabilities of hospital management,

and competitive position [19]. Further, development of organization structural changes required should coincide with information system development [2].

After the organization has selected the appropriate model for PLM, an appropriate management structure must also be put in place. Fetter and Freeman [6] argue that a matrix structure best recognizes the product lines provided by the hospital. A matrix structure is defined as "the existence of both hierarchical (vertical) coordination through departmentalization and formal chain of command, and simultaneously lateral (horizontal) coordination across departments." Fetter and Freeman [6] characterize the matrix organization as one with dual lines of authority and responsibility. Physicians can become the project or product managers, and department managers are responsible for the results of operations of functional departments.

A matrix organization provides a balance between the strengths of each of the product and functional forms. Under a matrix organization, a product orientation is superimposed on a functional organization. Budgets are allocated both by product and function. Approximately 15% to 20% of the hospital's employees are responsible to more than one supervisor, and both bosses participate equally in performance appraisals of subordinates. Advantages of a matrix structure

include balancing the best of both the product and functional organizations, high commitment of employees, and increased flexibility of the hospital to respond to market changes. Weaknesses include ambiguity in dual reporting relationships, increased managerial cost in time and personnel, and the need for adequate training of staff [5]. Once a matrix has been developed, performance of each product line can be managed in terms of price or cost, resources per case, resource unit price, and resource efficiency [6].

Another consideration in the design of a PLM system relates to the utilization of support services such as personnel, finance, housekeeping, plant maintenance, etc. Under PLM, these staff services should be a corporate objective and not a product line objective. Staff activities such as finance and personnel should work closely with product lines, but should answer to the chief executive officer. In the Johns Hopkins example, each business unit may use central services of the hospital such as housekeeping, dietary, and maintenance, but the business unit may also switch to other providers if services of equal quality can be purchased at a lower cost. This situation seldom arises because the hospital is pressured to provide good, affordable central services [18].

B. ADVANTAGES OF PRODUCT LINE MANAGEMENT

Several advantages to a hospital of PLM have been identified in the literature. Advantages fall into many categories, including organizational structure and culture, external markets and competitors, cost control, resource allocation, and an improved customer focus. Respondents in a 1988 survey identified advantages of a PLM system. These include increased control of revenue and costs, better evaluation of manager performance, better control of market share, and improved accountability [7].

Charns identified three main benefits of PLM. First, PLM allows for quick identification of changes in the environment, patient demographics, case-mix, and other information. Second, PLM results in better understanding of the impacts of changes in the environment and allows for target marketing. Third, PLM allows for better control and allocation of increasingly scarce hospital resources [5].

Studnicki concluded that PLM has a number of benefits including focusing accountability for operations in one person, facilitating coordination among functional departments, stimulating market segmentation, and promoting the rigorous evaluation of services [22].

PLM has been found to have a positive impact on the structure and culture of the organization. PLM can allow hospitals to respond to a complex and changing environment by pushing responsibility further down the organizational chart and encouraging participatory decision making. An important benefit of a PLM system is that it forces management to look at traditional activities with a new perspective. The transition can stimulate much creativity and innovative thinking so necessary in the current health care environment. Open lines of communication and an emphasis on education are essential [15]. Humana experienced an explosion of innovation and creativity that occurred when people were moved from a geographic responsibility into a focus on a single product line [10]. Another unexpected benefit of PLM that has been experienced is the "creative tension" created between top managers and product managers. Product managers will pressure the CEO to reduce overhead costs that can have a negative effect on the product manager's product line [18].

Another advantage of PLM is in the area of marketing and focusing on the patient as the center of care. Because of the high fixed costs of hospital operations, increasing patient volumes may be critical for success [14]. PLM enhances quality by getting the hospital's organization close to physicians and patients. In complicated functional organizational charts, patients can get lost in the cracks

between departments. PLM allows the hospital to be more responsive to current issues associated with patient care [4].

A primary benefit of PLM identified in the literature relates to the allocation of scarce hospital resources. PLM requires that resource allocation decisions be made based on the product's ability to generate a return on its investment. Traditionally, hospitals have based resource allocation decisions on a variety of criteria, but seldom on a profit measure. In a time of scarce resources, PLM gives hospitals a structure by which they can allocate money, time, and human resources to those activities that can provide the greatest return to the hospital which may be required due to the increased costs of implementation of a PLM system, including sophisticated management reporting systems, hiring additional staff, and increasing marketing efforts [3]. PLM may allow hospitals to better allocate the resources they currently employ and not increase total costs. PLM allows a hospital to streamline activities and avoid inefficiencies and duplications between departments.

Several other benefits of implementing a PLM structure have been identified in the literature. PLM provides information about the connection between departments and functions of the organization. At the same time, PLM reduces the complexity of health care organizations from the

customers' (physicians and patients) perspective. PLM provides management with accurate information that gives the hospital a stronger position in negotiations with third party payers. PLM allows for comparisons with competitors on the basis of quality, cost, delivery mode, and pricing [9]. PLM allows smaller hospitals to compete effectively with larger ones [10]. Further, a hospital can use PLM to improve the practice of medicine and make it more efficient, which involves information and education of physicians in making medical decisions [4].

C. DISADVANTAGES OF PRODUCT LINE MANAGEMENT

The disadvantages of PLM mainly revolve around the efforts that accompany implementation and the maintenance of the system [9]. Respondents in a 1988 survey identified weaknesses with PLM, including coordination difficulties, problems in implementation, and difficulties in allocation of overhead costs [7].

PLM has been losing popularity with many manufacturing companies for several reasons. First, PLM can create conflict and frustration. PLM does not replace the functional design, but is overlaid upon it. This fact, along with the potential for the product manager's responsibility exceeding his authority, can lead to confusion in the decision making process. Second, product line managers, due to their generalists role, are often asked to make decisions requiring technical expertise that they may not possess. Third, the task of managing an entire product line can cause the product manager to lose touch with distributors, marketers, or consumers. The product manager may become consumed by internal problems. Finally, PLM can be a costly management structure in terms of labor costs. Product managers exist in addition to functional managers which can create excess administrative costs [3].

Another danger of PLM is in creating such a specialized role for a product manager that it is difficult to fill the position or to replace a product manager that leaves the organization [4]. Manning [15] argues that the experience needed for a successful product manager is currently not being cultivated in today's functional hospital. Furthermore, the necessary skills for an effective product manager may command a prohibitively high salary level.

Others argue that PLM is not appropriate for healthcare. It is said that patients cannot be treated as equivalent to a product. The concept of aggregating patients into product lines may be viewed by physicians and patients as too technocratic and representative of an assembly line approach. Each patient is unique, and it has been argued that patients should not be grouped into product lines [5].

It is also argued that the hospital industry is too constrained relative to other industries in its ability to pick and choose the services it provides. A basic core of services must be maintained for accreditation, ethical, operational, legal, and public image reasons [5]. And in the case of small, primary-care hospitals, the volume of any particular service is not high enough to support the specialization required for PLM [7].

D. THE PRODUCT MANAGER

An essential element of a PLM system is the designation of a product champion whose responsibility is to promote the product line [3]. This involves the creation of a managerial specialist with expertise in a specific product who is able to concentrate solely on the issues relating to a single product line, cutting across organization hierarchies [7]. Selection of a product manager is a key to successful implementation of PLM. The product manager's only responsibilities are to understand the product and its markets. The potential benefits of this arrangement are greater commitment, deeper understanding and focus on markets, faster planning and implementation, better communications, and better resource allocation.

The functional manager is responsible for the production of services required by product lines. The functional manager coordinates the utilization of labor, supplies, and overhead within a hospital department to efficiently produce products and services required [2].

The product manager, however, manages patient volumes by directing product lines that are responsive to the needs of the market through market channels, i.e. physicians. The product manager is responsible for the volume of services demanded from functional departments [2]. Product line

managers are responsible for the success of their product line in the marketplace. This includes monitoring the external environment, and for coordinating internal resources necessary to support the product line [3]. A particular hospital service may involve up to two-thirds of the hospital's 50 or 60 individual departments. This makes it difficult to coordinate services with the number of management people involved. Having a product manager to coordinate these activities allows the hospital to respond more quickly and to provide better service [4]. The product manager is responsible for market changes and addressing product needs, and is concerned with coordination and communication across departments. The functional manager is concerned with work load and the needs of the department, and is responsible for coordination and communication within the department and across product lines [18]. Product managers are responsible for specific groups of patients, and functional managers are responsible for clinical support services [7].

A product line manager can be a generalist who can learn the specifics of a technical area or a technically trained person who receives general management training. Technically trained employees would be better suited to highly clinical areas such as cardiology. A product manager is a blend of line manger and staff. However, a product manager needs to become more of a coordinator and facilitator and less of a

line manager to be successful [4]. In large teaching hospitals, product managers would likely be physicians. For smaller community hospitals, operations managers can be assigned product management responsibilities [18].

The product manager would have a wide variety of duties in order to assure the continued success of the product line. Fottler lists five functions that must be performed by a product manager. These include market analysis, goal setting, planning and budgeting, coordination of work, and control. One of the roles of the product manager is to submit to top management a budget including sales forecasts, projected income and expenses, and capital outlays for his product line [7]. The product manager should be assigned responsibility and authority for the internal profit/loss of the product line [18].

Product line managers need to be highly involved in developing strategic plans. If the organization wants the product manager to take ownership of the strategic plan, it would be a mistake for administration to develop the plan, then turn it over to the product manager to implement. Also, product managers would have greater information for development of strategic plans [4].

A key to the success of the product manager and consequently, the product line, is for administration to delegate to product managers the authority for decision-making concerning issues under the control of the product manager commensurate with the responsibilities given to the product manager. In the literature, several authors made the point that decision-making must be decentralized in order for PLM to be successful.

Product line management is still used heavily in manufacturing, but often in a modified format from that of Proctor and Gamble's original model. Product line managers are now likely to be part of a product team of individuals selected from the production and marketing of the product. With this approach, technical skills and resources are brought together and decisions are made during team meetings. Better decisions can be made with more information, and cooperation is emphasized rather than internal competition [3].

A lesson learned from the research of Bowers and Taylor [3] on PLM in healthcare was the need to integrate the product manager into a product team as opposed to the product manager operating independently. Because required expertise may not be found in one person, many hospitals have established a team approach to PLM. This approach is also supported by a majority of respondents to a 1988 survey of hospital

executives [7]. The provision of health care is complicated and results in an interactive product delivery system. This can cause the job of the product manager to be too broad for one individual to handle. This situation calls for the implementation of product teams where functional areas can work together to coordinate the delivery of services [3].

Another model of product line management that has proved effective includes forming "task forces" of limited duration which allows multiple perspectives into the decision-making process. Under this model, the product manager plays a key role in facilitating task force meetings, representing the task force to the rest of the hospital, and managing conflicts among task force members. A further step in PLM involves developing more permanent product teams having broader responsibilities. Permanent teams are more powerful in influencing behavior, but can also be perceived as a greater threat to the influence of functional departments [5].

E. PLM IN OTHER HOSPITALS

Several research projects have been focused on cost and outputs of hospitals. A major limitation in these studies is the method used to account for the multi-product nature of most hospitals. Hospitals provide an extensive variety of services and differences in hospital product lines play a significant role in understanding the cost differences between hospitals and in the differences between patients within each hospital [6].

Bowers and Taylor conducted a telephone survey in 1990 to study ten hospitals' attempts to organize around PLM. The study was a preliminary investigation and was exploratory in nature. The survey found that five hospitals were employing some version of PLM. Three of the hospitals were planning the implementation of PLM, and the remaining two hospitals were not involved in any way with PLM. Reasons for not implementing PLM included satisfactory operating levels and the conservative nature of the hospitals' administrators. The product lines most commonly identified in this study included cardiology, oncology, and women's health services [3].

In a survey of hospital executives conducted in 1988, 67% of responding hospitals felt PLM was applicable to most hospitals. However, 33% felt that PLM was limited to certain types of hospitals. Of the respondents, 58 % felt that their

hospitals would eventually adopt PLM. The likelihood of the adoption of PLM was increased for large hospitals, urban hospitals, and for-profit hospitals [7]. Another 1988 survey concluded that PLM was becoming increasingly prevalent in health care facilities. In addition, a significant number of respondents noted that their institutions were considering implementing product lines. The most popular services lines identified in this survey were cardiopulmonary care, emergency care, intensive care, and oncology [8].

A survey of California hospitals larger than 100 beds conducted in 1987 showed 82% have implemented, will implement, or are considering implementing PLM. This survey found that the services most likely to be organized as product lines include cardiac care, oncology, maternity, geriatric services, substance abuse, mental health, orthopedics, occupational health, and pediatric services [23].

A 1986 study of six large urban hospitals found that PLM was a successful tool for improved market segmentation, cost and quality management, and corporate culture change. The study concluded that PLM was not a "quick fix" solution, rather it was a painstaking process. Recent surveys indicate that PLM has had a positive financial effect on hospitals that have implemented the organizational change [8]. In each

hospital studied, some type of organizational crisis precipitated the move to PLM [20].

Johns Hopkins Hospital is an example of an institution that has successfully implemented PLM. The hospital has developed 12 operating units (product lines) into a structure where the hospital has become a holding company for a series of specialty hospitals. Johns Hopkins uses a team management approach for each product line. Top management of the hospital has relinquished control over operations to product management teams that are responsible for performance of their product lines [7].

There exists in the literature a wide disparity in the numbers of hospitals reportedly using PLM. Various surveys have arrived at differing results. Charns concludes that this is due to the variation and confusion in the use of "product line management" and related terms. They conclude, however, that there appears to be a great deal of interest in PLM and it is estimated that a "good percentage of the health care institutions in this country will be using it in some manner" [5].

The most recent research available on the extent of utilization of PLM by hospitals was in 1990. More recent discussions of the topic were not found. This may be because

PLM has become more accepted and no longer a new research topic, or that it has fallen out of favor with hospitals. An attempt was made to answer this question by discussing PLM with administrators and professionals at St. Patrick Hospital, other hospitals in the region, and others knowledgeable about healthcare issues including hospital consulting firms.

Gene O'Hara, Executive Vice President of St. Patrick Hospital, researched the issue in the late 1980s when he was an administrator at another large Montana hospital. He decided not to implement PLM at that time due to the many problems encountered by other hospitals that had attempted PLM. The main problems encountered by other hospitals revolved around the conflicts that arose between product managers and functional managers. It was difficult finding the right product manager with the required level of technical, management, and financial skills. The system created an elitist group (product managers) and was detrimental to teamwork. The external environment was secure enough that a hospital could be successful without PLM. The environment was not threatening enough to force hospitals and physicians to break down the traditional barriers between functional departments and between clinical specialties.

Rob Reece, a Hospital consultant with the Cambridge Research Institute echoed the problems identified by Mr.

O'Hara. He feels that a mistake made by many hospitals was to attempt to utilize the manufacturing model of PLM for healthcare without the required modifications for the unique nature of hospitals. Many hospitals jumped into PLM without a thorough understanding of the culture of their organization. Mr. Reece believes that many hospitals were not flexible in their implementation of PLM. According to Mr. Reece, hospitals need to "keep it lose" and be willing to modify the traditional form of PLM to conform to the culture of the organization. Mr. Reece also believes that PLM should be more a market-oriented effort as opposed to a product-oriented effort.

In a conversation with Mark Burzynski, Chief Financial Officer of St. Vincent Hospital in Billings, Montana, he stated that St. Vincent has decided not to pursue PLM at his time. Mr. Burzynski feels that PLM has potential, provided hospitals can overcome the cultural barriers that exist. Hospitals need to get past departmental thinking that currently prevails. Specialization has become so ingrained in hospital professionals, that it is very difficult for hospitals to make such a radical change in philosophy. Egos and turf issues get in the way. A hospital would need a sophisticated and mature management team to make PLM work. Even the physical layout of most hospitals reinforces the functional approach. Mr. Burzynski pointed to the automobile

industry as an example of an industry that was forced to make a radical change in a long standing philosophy of doing business. The change required the industry to move geographically and start over with a new management team in order to break free of the constraints of the traditional bureaucracy.

Another problem identified by Mr. Burzynski was the timing of the introduction of PLM. PLM became popular just as many hospitals were experiencing extreme financial turmoil. Most hospitals were merely trying to stay afloat, let alone attempt to introduce a radically new management philosophy.

Anne Cavanaugh, a consultant who has worked extensively with St. Patrick Hospital in the implementation of Continuous Quality Improvement (CQI), was not aware of any of the many hospitals she has worked with that have implemented PLM in its true sense. The examples of PLM she has come into contact with mainly involve a marketing focus on a particular service (i.e. "centers of excellence") versus an institutional reorganization required for "true" PLM. Anne believes that PLM may have been somewhat of a fad that was not wholeheartedly embraced by hospitals.

Vince Huntington, Vice President of Deaconess Hospital in Billings, Montana shared his experiences and viewpoint of PLM. Mr. Huntington is moving into a position at the hospital which is essentially a product line manager position for cardiac care. Deaconess is creating a product line for cardiac care by setting up a separate entity from a combination of resources from both Deaconess Hospital and a physician clinic. Based on his research, Mr. Huntington feels the future of cardiac care will be to organize services as a separate product line.

Mr. Huntington has also had experience with distinct product lines when he was Chief Operating Officer for a large Idaho hospital. His hospital was successful at competing with free-standing surgical centers by packaging specific procedures and marketing them separately. The hospital was able to demonstrate improved value to the consumer, despite the fact that the hospital charge was higher than the amount charged by the surgical center.

Mr. Huntington believes PLM is a highly marketing-centered approach. PLM involves identifying target markets and defining the service to match the demand of the market. Pricing is a key element of the marketing plan. Certain markets and services are more price-elastic than others. It is very important to have a thorough understanding of the target market.

Dangers of PLM for hospitals are mainly centered around organizational culture and structure. Conflicts arise between functional managers and product managers. Functional managers fear loss of responsibility and can be threatened by a shift to a product-oriented focus. After a service has been spun-off as a separate product line, product managers may work contrary to organizational goals by attempting to bring the service back within the traditional structure of the hospital. There is also the danger that the product lines become too much of an independent entity and lose touch with the overall organization.

The solution, according to Mr. Huntington, is good management and matching the product line model to the structure and culture of the organization. If the hospital is a top-down organization with a strong CEO, product managers should be "managers" with decision-making authority. If the organization is one where decisions are based on consensus and teamwork, a "facilitator" would make the best product manager. Required in the facilitator model is a shared vision that is well understood by all hospital staff. Then you can have everyone pulling together for the overall good of the organization.

Finally, Mr. Huntington feels a hospital needs a clear understanding of the reasons for implementing a product line

system. Specific, measurable goals and outcomes need to be defined. Otherwise, PLM can become an "interesting experiment" with a high likelihood of failure.

F. IMPLEMENTATION OF PRODUCT LINE MANAGEMENT

Implementation of a PLM system involves excellent planning. The culture of a hospital can work to deter an organizational change process. Transition requires commitment on the part of management, employees and medical staff. A timeframe of two to three years should be expected for a transition to PLM. An organization chart can be changed over night, but time must be allowed for developing commitment. This typically involves several cycles of budgeting and performance evaluations [5].

Implementation of PLM in hospitals requires a fundamental reform of the structure of the organization and a redistribution of responsibilities and authority. Such a reform requires both time and an explicit plan of implementation [9].

Lowe identifies eight steps to a successful transition to PLM [10]:

1) Identify product line priorities based on hospital objectives, volume potential of the product line, profitability, and long-term growth potential.
2) Set up a supportive organizational structure.
3) Define new responsibilities and reporting relationships.

4) Develop an accounting system that identifies true costs.

5) Name the right product managers.

6) Anticipate and plan for initial resistance and confusion by developing a forum to resolve issues that arise.

7) Develop realistic marketing plans.

8) Be flexible at first and allow for mistakes to be made.

Patterson [19] lists four criteria for successful implementation of a PLM structure:

1) Employees, physicians, and board members must have the skills and attitudes to handle change.

2) Appropriate information systems must exist to support a new organizational decision model.

3) Organization structure must be appropriate.

4) The hospital's management style or culture must be compatible with PLM.

Most authors agree that implementation of PLM should be a gradual transition. Fottler suggests that hospitals proceed toward PLM in stages to allow for education to take place at all levels of the organization and for a change in corporate culture to take place [7]. According to MacStravic, PLM should be introduced incrementally. The product line approach

should only be used where it is effective to do so, and not forced on all hospital services [14].

Agreement also exists as to the level of commitment required for successful transition to PLM. According to Alfirevic, a dedicated and ongoing commitment is required at all levels of the organization for successful implementation of a PLM system. This also includes a commitment to education and staff development. The hospital must implement extensive management development and training for successful implementation of a PLM system [2].

Nackel argues that the implementation of a PLM system must be a top-down rather than a bottom-up process because of the organization structure requirements involved [18].

An element of any implementation plan is the development of a management information system. PLM requires monitoring and controlling in a completely different way than traditionally seen in hospitals [9].

According to Patterson, implementation of a PLM system requires that the hospital have a clear and well understood business mission built on the need to achieve a closer relationship between the hospital, physicians, and markets served. It should be perceived as a win-win situation [19].

The overall business objective of instituting a product line management system is to improve the management of profitability and quality [2].

Successful implementation of PLM requires a gradual introduction, dedicated management professionals, clear objectives and operational policies that clearly outline authority and responsibilities, and management training programs. Improper implementation of PLM can lead to resentment on the part of the medical staff. When PLM is implemented, hospital hierarchies change, and physicians often lose power in making key decisions [23]. Lowe also lists five actions that can lead to the failure of PLM [10]:

1) Expect and demand instant success.
2) Ignore physician attitudes.
3) Assume you know what the market wants.
4) Concentrate on cost or quality alone. Patients demand both.
5) Have only tentative commitment from top management.

The implementation of PLM should be a structured process. The hospital should start with a major product such as cardiology. Then the hospital should form a multi-disciplinary team of medical staff and hospital professionals, including planning, marketing, finance, administration, and patient care. The hospital should expect implementation to

take six months to a year and can continue for five years or more [19]. Nackel identifies the following action plan for the implementation of PLM [18]:

1) Inform management, physicians, and trustees of the PLM philosophy and obtain consensus on implementation.
2) Define the product lines around which the hospital will be structured.
3) Identify organizational responsibilities for both functional and product line perspectives.
4) Develop a planning and budgeting process around the product line perspective. Review decision support systems and evaluate their capacity to serve these processes.
5) Communicate the organizational change adequately throughout the organization.
6) review and reassess the PLM system on a periodic and predetermined basis.

G. IDENTIFYING PRODUCT LINES

Once a hospital has decided to implement a PLM strategy, the organization needs to decide on a method for defining its product lines. Historically, hospitals have treated each patient as a unique case. It is possible to establish statistically homogeneous groups of patients that can correspond to the concept of a "product" and track consumption of resources by patient group [13].

A hospital should have a specific purpose for establishing a product line. The product line should be central to the needs of the hospital, and must be sufficiently complex to justify assigning an additional management person to the product line [4]. Requirements for the classification of products into product lines include the requirement that the products need to be aimed at a target group, related facilities are involved, and a relatedness exists in the type of technology applied [9]. One method for identifying product lines for hospitals is to determine which factors are important in determining the type and amount of goods and services provided to patients [6].

Janssen suggests that in defining its product lines, a hospital combine a "broad" strategy with a strategy that every service is unique. Product lines should be defined narrowly enough that products are related according to management,

physicians, and patients, but general enough that economic management is possible [9].

Janssen [9] identifies five criteria for defining product lines:

1. Activities performed on behalf of products should be measurable.
2. A causal relationship should exist between activities and cost.
3. A control system should reduce the complexity of the situation under control.
4. The information of cost control should be comparable with information from other hospitals.
5. Individuals in the organization should be held accountable for the quality and cost of activities.

Manning [15] defines five criteria for identifying product lines:

1) The proposed product line must be identifiable to the market.
2) The product line must be an administratively manageable unit.
3) The product line should be significant in relation to total hospital activity.
4) The product line should be subject to similar treatment patterns by medical staff.

5) The product line must provide a meaningful basis for marketing, resource allocation, monitoring, and control.

A central impetus to the original move to PLM in hospitals was the implementation of PPS and the DRG system. Fetter and Freeman [6] believe the DRG system provides a basis for determining product lines within hospitals. Each DRG is defined in terms of principal diagnosis, operating room procedures, comorbidities and complications, and age. "As such, DRGs represent a multi-variable system for classifying hospital discharges from acute care hospitals into patient groups or types of cases with similar expected patterns of resource use" [6]. According to Fottler, a potential starting point for identifying product lines is to consider the mutually exclusive and exhaustive Major Diagnostic Categories (MDCs) [7]. All principal diagnosis codes have been condensed into 25 MDCs. Diseases that tend to be diagnosed and treated by similar physicians in similar ways are grouped in the same MDC. MDCs are arranged by body system (see Exhibit A). Each hospital discharge is classified into only one MDC [6].

Summarizing data by diagnosis related groups (DRG) or major diagnostic category (MDC) can be an initial step for defining product lines for inpatients. Defining and reporting

outpatient products may be more difficult and require the information system to capture data in a different way [2].

H. POTENTIAL BARRIERS TO IMPLEMENTATION

Barriers to PLM have been characterized as either "traditional" or "operational". Traditional relates to the resistance to change and reluctance to relinquish power on the part of the administration and the medical staff. Operational refers to the absence of the sophisticated management information systems required to monitor the performance of PLM.

Fottler states "health services have been traditionally viewed as highly personal in the sense that they are nonstandardized with every case perceived as requiring unique and individual attention". Hospitals, especially not-for-profit institutions, are more constrained than the average business in their ability to pick and choose services to be provided. A basic core of services must be offered for licensure, ethical, operational, and community service reasons [15]. In addition, cultural constraints in the hospital's internal environment often make radical change difficult, even when survival is at stake [7].

Effective product line planning will be measured in relation to how well the mix of products or product lines fulfill the hospital's mission [14]. The goals for the product line must be consistent with the hospital's larger goals and budget [7].

PLM requires that decision making be moved down the organizational chart. Management must be willing to empower the product manager to make decisions, otherwise it would be defeating the purpose of PLM which is quick, coordinated response [4]. Fottler argues "to induce a manager to accept total responsibility for the areas under his or her control, top management must be willing to bestow the commensurate authority on the individual". Fottler believes that top management must be ready to delegate both responsibility and authority to product managers before they attempt to restructure around the concept of PLM [7].

One of the most common hazards in the transition to PLM is confusion arising from changes in authority and reporting relationships. Other barriers identified include the potential proliferation of overhead support cost of introducing and maintaining the new administrative function, lack of management skills of middle managers who were given more authority under the new structure [3], confusion in the roles of product managers, unproductive internal competition and friction, ignoring other essential services that have not been organized as product lines, an over-emphasis on short term profits at the expense of long-term growth, and resistance to change and complacency on the part of administration and medical staff
[5][10].

I. PHYSICIAN ISSUES

In contrast to other industries, the health care business is unique in its patient distribution system. No other industry has a counterpart analogous to the role played by physicians. In addition to being the primary producer, the physician represents the primary market channel of the hospital [2]. Hospitals do not have the latitude other industries can have in controlling the activities of its distributors [15].

Patients traditionally move through the hospital production process under the direction of a physician who is likely not an employee of the hospital. Patient care services are under the control of hospital management, but the amount of services ordered is not. It has been demonstrated that in hospital care, significant cost variations can exist between hospitals, even for the treatment of well understood illnesses with consensus among providers as to the appropriate treatment process. Variation is almost solely a physician-determined variable. It can result in a particular patient's bill being up to three times larger than others for essentially the same type of patient and similar outcomes [6]. Clearly, hospitals need to overcome the duality in the decision-making process caused by the differing interests of management and physicians. PLM is designed to separate responsibilities according to who controls costs [9].

A major obstacle of the adoption of a PLM system is the belief that in health care, the nature of the doctor-patient relationship places on the physician the "moral burden of ultimate responsibility for the outcome of the case. There is a strong ethical presumption that the doctor be left alone to do whatever is necessary for the patient's well being" [6]. For this reason, it is imperative that hospitals work closely with physicians in transition to PLM in order to earn trust and respect. Active involvement on the part of physicians was a popular method to obtain medical staff support for the PLM concept [8]. Incentive systems, such as the one developed by Johns Hopkins Hospital in Baltimore, can also help develop physician support for PLM [11].

Medical staff is interested in both outcomes and process. PLM should not be attempted in an area which has significant turmoil on the part of physicians. But if physicians are willing to understand and support the change, it creates a natural setting for successful implementation of PLM [4]. Definition of product lines must reflect the dynamics of the hospital's physician distribution system. Development of information systems must tie physicians to hospital operations. Further, medical staff bylaws and enforcement techniques may need to be revised to meet the needs of a product line organization [15].

According to MacStravic, the major emphasis of PLM is cost control. Unlike traditional approaches to cost control which focus on functional departments, PLM cost control focuses on the way physicians practice medicine. The major focus of PLM cost-control activities is the volume and timing of ancillary service consumption, and the timing of admission and discharge. "The challenge of influencing physicians to use hospital resources more prudently and efficiently is a totally new one for most institutions" [14].

J. INFORMATION SYSTEMS

A major problem in the traditional hospital is that information systems do not support the type of data collection necessary for good management decision making. Manning believes that the integrated management information systems required to support a PLM system are only beginning to be developed [15]. Implementation of a product line management system requires a significant investment in management information systems. The hospital's information system must have the capability to model a variety of payment scenarios and have the capacity to provide accurate profitability and cost information by product line. The information system must also capture adequate demographic information. Traditional transaction-based information systems are inadequate for the decision support requirements of a product line management system [2]. Traditional hospital systems have been designed to monitor and count activities such as numbers of patient days, lab tests, or surgical procedures rather than to design a set of services that meet the needs of a particular group [21].

Hospitals undertaking PLM must organize their transaction processing systems to serve the needs of the product managers as well as the traditional data collection function. A linkage between decision support systems and transaction processing systems needs to be developed. Product managers

need cost information from the general ledger, payroll, and other transaction processing systems. In addition, the product manager needs access to decision support systems providing information for planning, budgeting, pricing, profitability, variance reporting, marketing, staffing, recruiting, and other day-to-day activities [18].

Machado states that "80% to 90% of decisions with economic effects are taken by doctors. It must be noted that in spite of this, doctors traditionally consider neither prices nor any other economic variable to bear on their decisions". It is therefore necessary that hospitals develop information systems that allow physicians to select therapies taking into consideration relative cost and efficiencies [13]. For this reason, the product line manager must have at his disposal databases to manage physicians as the primary market channel. Systems need to have the capacity to monitor volume and profitability data by physician, physician group, clinical specialty, and payer mix. Information systems will need to have the capacity to track specific services used in the production process in order to adequately manage clinical costs. Systems should also be able to monitor physician practice patterns and report variances. External comparisons to peer institutions by product line will allow hospitals to better manage costs. Market information needs will likely be met by a combination of comprehensive cost accounting systems,

market demographic systems, and market research capabilities [2].

Hospital information systems have traditionally provided their department heads with only actual versus static budget comparisons classified by type of expense. This type of reporting is deficient because functional managers have little control over the volume of services demanded. The information system must separate variances due to volume, mix, and practice variations that are outside the span of control of the functional manager. The hospital must develop a flexible budgeting system that reports variances attributable to the functional manager separately from those that are the responsibility of the product line manager. Successful implementation of this type of reporting system requires integration of case-mix, forecasting, standard cost, flexible budgeting, and productivity reporting capabilities [2].

For matrix organizations to be successful, the institution must have in place an adequate cost accounting system that distinguishes between fixed and variable costs and includes regular variance reporting systems. Fetter and Freeman argue that case mix cost accounting and budgeting systems that provide information along product line are essential for the success of a PLM system [6].

Traditionally, allocation of fixed costs to product lines has been a result of mandated cost reimbursement or arbitrary reporting requirements and of little benefit to hospital managers for decision-making or control purposes. The hospital information system must allow for segregation of the effects of changes due to quantity, mix and contribution margin variances by product and department. Responsibility for variances in quantity and mix can be assigned to product managers, and the functional managers can be responsible for the contribution margin variances [16]. Management information systems that report on productivity, efficiency, and quality by product and product line are required to determine the potential or necessity of changing the way services are delivered, thereby altering expenditures [14].

There has been a proliferation of software systems over the past several years that will adequately support the diverse requirements of a product line management system. The unique mix of systems utilized will be determined by the specific needs of each hospital [2]. Product managers are using new, sophisticated software systems to evaluate their services and are finding that costly or inadequate medical practices can be identified and, in some cases, changed [16]. Product line management systems require significant organizational resources to implement and maintain. The

hospital should survey its internal capabilities before selecting an information system [2].

III. CURRENT ISSUES AFFECTING HEALTHCARE & PLM

A. HEALTHCARE REFORM

A key element in the discussion of any issue affecting healthcare is the impending reform of the U.S. healthcare system. The Clinton Administration has made its proposal public, and the nature of the proposed change is dramatic. Although the U.S. Congress is likely to make numerous modifications to the Clinton proposal, it is the consensus of most healthcare professionals that the basic elements of Clinton's proposal will be passed by Congress by late 1994.

Hospitals have historically been reimbursed for services provided to patients based on some form of fee for service. Every time a patient was treated, the hospital received reimbursement, either on a fixed fee basis, at the stated hospital charge, or at a negotiated discount from the stated fee. In the case of not-for-profit hospitals, those patients who did not have the financial means to pay their bills would receive care free of charge as charity care. Hospitals were forced to inflate their prices to those with the means to pay in order to make up for the shortfall from federal programs (Medicare & Medicaid), charity care, and bad debts. The incentive under this type of reimbursement system was to increase the utilization of hospital services, especially those services that had the most favorable reimbursement.

Under the proposed reform measures, healthcare providers would be compensated on a capitated basis. A provider group (an integrated network of providers) would contract with Health Alliances (large purchasing groups) to provide coverage for all the basic healthcare needs of a specific population for a predetermined fee for each covered life. The provider group would receive capitated payment, regardless of whether or not those covered under the program received care. Thus, the incentive of this system is to discourage utilization of healthcare services, particularly those high-cost services. The incentive is on prevention in order to keep people healthy, and to utilize the lowest cost treatment that is appropriate.

Health plans (providers) would be organized to provide all the basic healthcare needs of those covered by the plan. Specialty and high-tech services would still be made available. The health plans could provide specialty services themselves or could contract with other health plans to provide specific specialty services to those covered. Those providing specialty services would need to provide high quality services in a cost-effective manner. This would require specialized expertise and high volumes. The result of this arrangement is that it allows providers to establish niches that can be marketed separately. The only way for a health plan to bring in additional reimbursement over and

above the capitated payment amount would be to contract specialty services to other health plans. This arrangement could cause providers of specialty services to organize such services as product lines and use the principles of PLM to market the product line, as well as to better manage cost and quality.

B. CRITICAL PATHS AND STANDARD TREATMENT PROTOCOLS

One concept that is taking hold at St. Patrick Hospital, as well as in many other hospitals, is the concept of "critical paths". A critical path is a standardized sequence of steps and procedures performed for each patient unique for each diagnosis (product line) to meet stated outcomes. St. Patrick Hospital has developed critical paths for many diagnoses and is working on completing others. Critical paths provide a road map for the provision of services for each patient. Critical paths can facilitate the implementation of PLM by providing clinical data to supplement financial data for specific product lines.

Standard Treatment Protocols (STPs) are a further refinement of critical paths. STPs are designed to manage the cost and quality of medical occurrences in an integrated fashion. STPs are focused at providing value to healthcare consumers by simultaneously raising quality and lowering costs. They accomplish this by defining and standardizing the best care for a typical patient in a diagnostic category [12].

STPs are similar to critical paths in that the emphasis is on standardization. The difference is that STPs directly address the cost of providing care by utilizing a tool called the "charge/cost model". Both practices are consistent with

the CQI philosophy by focusing on standardization and refinement of processes. Both can be an important catalyst in changing the culture and philosophy of the organization and demonstrating to practitioners that standardization of medical practices will positively impact both quality and cost [12].

Another common element of both practices is that they focus on specific diagnoses or product lines. Efforts to manage standardized treatment processes will be enhanced by a move towards PLM. Clinical and financial product line data will need to be studied to successfully manage both critical paths and STPs. The concepts of both critical paths and STPs are consistent with the philosophy of PLM.

C. HEALTHCARE NETWORKS

In the current healthcare environment, sharing of information and pooling of resources is one way providers can establish better referral patterns and control costs. Healthcare providers are increasingly working to form healthcare networks to take advantage of shared resources and economies of scale.

A common form of healthcare network can be described as a loose affiliation of providers involving the sharing of resources and ideas. Smaller, primary care hospitals can benefit by availing themselves of educational and other opportunities provided by larger institutions that the small hospitals would not have the financial strength to provide for themselves. Larger, tertiary care hospitals can benefit from establishing referral relationships with smaller communities, thus increasing volume of specialty services.

A further step is to have providers form integrated health networks. In integrated networks, the interests of all parties are merged. There is often a financial element binding the parties together such that the success of each member directly enhances the success of other network members. As healthcare reform takes hold, it is the opinion of many people knowledgeable about healthcare issues that integrated networks of providers (hospitals, physicians, home health

agencies, and other providers) will emerge as the predominant form of healthcare delivery.

The increasing emphasis on health networks will heighten the importance of PLM. Product lines can be developed for the entire network. Coordination of services and cost control will become increasingly important. With PLM, small hospitals will have a single contact person in the specialty hospital that they can refer issues regarding a specific product line. Integrated networks can market specialty services to other networks, provided the services are competitive in terms of cost and quality. PLM will enable networks to manage product lines in an integrated fashion to achieve the required cost and quality goals.

IV. FEASIBILITY OF PLM FOR ST. PATRICK HOSPITAL

Up to this point, this paper has focused on general issues relating to PLM and the business of healthcare. Much of the discussion of the elements of a PLM system has been based on theoretical discussions in the literature. Insufficient practical information was available regarding actual results experienced by hospitals due to the implementation of a PLM system. The only such information was based on personal discussions with those that have significant experience and expertise on matters relating to hospital operations.

The goal of this section of the paper is to evaluate both the theoretical and practical data and to conclude on the feasibility and desirability of St. Patrick Hospital implementing some form of PLM structure. The first step in this process is to assess the healthcare environment, as well as the climate, culture, staff capabilities, resources, and management skills of St. Patrick Hospital. From this assessment, a PLM model best suited for St. Patrick Hospital is presented.

A. ORGANIZATION STRUCTURE, CULTURE & MISSION

The Mission Statement of St. Patrick Hospital is ..."to provide a continuum of health services in an environment where healing and education can occur. We will do so in a collaborative, socially responsible way, allowing all participants to achieve their potential". Both the Vision Statement and the Statement of Values for the hospital emphasize teamwork as the best process enabling the hospital to serve others. In the sense that PLM requires functional departments of the hospital to work together in a team approach and that the goal of PLM is to provide a seamless continuum of care for the patient, the mission, vision, and values of St. Patrick Hospital are consistent with the philosophy of PLM.

The organizational structure of the hospital has not been ideal to support a cross-functional approach. The hospital has historically been a "top-down" organization and is still organized along functional lines. Reward systems for managers are still based on functional performance.

However, significant steps have recently been made to foster teamwork and cooperation between departments. St. Patrick Hospital has recently made significant inroads in restructuring the decision-making process. The hospital is currently implementing a Continuous Quality Improvement (CQI) program which will change the way decisions are made. Under

the CQI model, quality teams composed of hospital staff from all levels are assembled to address problems in a structured manner and present solutions to top management. The CQI philosophy is consistent with PLM principles in that decision-making is decentralized to the appropriate level. Further, CQI activities have created a change in management philosophy that fosters risk-taking and an acceptance of new ideas.

Discussions with several people with significant healthcare expertise (Rob Reece, Anne Cavanaugh, Gene O'Hara) suggest the hospital industry approach PLM differently than other industries. A team approach to PLM can help the hospital respond to the needs of the consumer without sacrificing the efficiencies of the existing production system [21]. The role of a product manager would need to be a facilitator versus a line manager.

According to healthcare experts, many of the difficulties experienced by hospitals in the transition to PLM revolved around the confusion surrounding reporting relationships and the mistake in creating a position for a product "manager" versus a product "facilitator". The difference is in the increased level of authority granted the product manager. Hospitals have done a very good job of creating numerous specialties within the organization, but often these special interests can conflict. A good facilitator would have excellent human relations skills to precipitate functional

departments working together for the overall good of the organization. This approach is also consistent with the CQI philosophy of quality teams, which are coordinated by team facilitators. The team approach would be consistent with other organizational changes currently being accomplished at the hospital.

In order for this approach to PLM to be successful, the organization would need to be one that values staff functions. The role of the product facilitator would be a staff function. Presently, St. Patrick Hospital appears to be an organization that highly values line functions. Through the work of hospital consultants and the CQI process, both of which are currently active within the hospital, the required change in organizational focus is taking place.

B. HOSPITAL MARKETING CAPABILITIES

A potential weakness for St. Patrick Hospital may be in the area of marketing. Marketing efforts have not historically been managed in a structured, coordinated manner. Several hospital departments conduct their own marketing programs. The hospital has a Community Services department which is assigned the responsibility for marketing, as well as public information and community service activities. However, because of the fragmented approach to marketing that currently exits, the hospital is not sending a consistent message and is not focusing its marketing efforts at specific target markets.

Clearly, if the hospital decides to implement a cross-functional approach and focus on specific product or services lines, marketing efforts must also be managed in a coordinated fashion. Part of the restructuring of the hospital's organization chart should be to combine networking, planning, and community services functions and to develop a coordinated, cross-functional marketing department. All hospital departments would need to funnel marketing activities through the personnel responsible for marketing.

A team of hospital professionals is evaluating marketing activities and attempting to coordinate future efforts. The hospital needs to coordinate these activities with the

reorganization efforts and develop a coordinated marketing program that would complement and support a PLM system.

C. IDENTIFYING PRODUCT LINES

Product lines for St. Patrick Hospital would likely include cardiac care, cancer treatment, orthopedics, trauma, behavioral medicine (mental health and addiction treatment), neurosciences, and ambulatory care (out-patient services, excluding mental health and addiction treatment). These are the services most often identified by St. Patrick Hospital's administrators and professional staff as the best suited to be managed as unique product lines. Occupational health services are currently being managed in a product line fashion.

Cardiac care would likely be the first service to be managed as a product line. St. Patrick Hospital has established extensive expertise in cardiac surgery. The hospital sponsors an annual cardiac surgery conference in which surgeons from around the world come to Missoula to learn various cardiac surgery techniques. St. Patrick Hospital is the only institution in the Northwest that is qualified to perform the "Ross Procedure". This surgical procedure replaces a diseased aortic valve with the patient's own pulmonic valve, then replaces the pulmonic valve with a donated heterograft. The advantage of this procedure is that the critical valve which experiences the most pressure (aortic) is replaced with the patient's own tissue, reducing the incidence of rejection. The Ross Procedure is very

complicated and requires up to ten years of training to perfect.

Cardiac surgery is the most common product line to be marketed by hospitals using some form of PLM [3,11,14]. Many hospitals have formed separate cardiac centers which house all the necessary support services required for cardiac care. These services are packaged and marketed over a wide geographic area for a pre-established fee. For example, The Texas Heart Institute in Houston markets cardiac surgery world-wide. St. Vincent Hospital in Portland, Oregon has packaged DRG 106 and 107 (coronary bypass with and without cardiac cath) and set the total cost to the patient for hospital and physician services at approximately $30,000.

St. Patrick Hospital's average patient charge for the same DRGs is significantly higher. St. Patrick has worked with its physicians and has set a goal to reduce the cost of DRG 106 and 107 by 20% by January 1, 1995. The hospital would need to control the usage of ancillary and support services in order to achieve this goal. This would necessitate a cross-functional approach to managing cardiac surgery procedures.

The volume (in terms of number of patients and total charges) of in-patient services provided by St. Patrick

Hospital is summarized in exhibit A. This analysis confirms that cardiac services make up the predominant in-patient services provided by the hospital. Exhibit A shows that the services identified by Hospital professionals make up the major product lines of St. Patrick Hospital.

D. PHYSICIAN ISSUES

In order to achieve a successful transition to a product line approach, significant change would be required at the physician level. However, many physicians have been reluctant to accept standardization in the treatment of patients. The success of critical paths at St. Patrick Hospital has demonstrated that standardization can lead to higher quality and lower cost. Also, discussions of proposed healthcare reform measures have changed the way many physicians view the practice of medicine. For these reasons, it is not likely that physician resistance to standardization will be a significant obstacle to PLM at St. Patrick Hospital

A greater problem may be the lack of organization among physicians at St. Patrick Hospital. For PLM to be successful, the infrastructure must be in place to support the system. A key infrastructure deficiency at St. Patrick is the lack of organization of physicians. Physicians must be organized within specialty groups, including cardiology, cardiac surgery, and anesthesiology in order to insure success of a coordinated cardiac product line. Currently, physicians practicing at St. Patrick function independently which makes it difficult to develop the coordinated approach to managing cardiac services required under PLM. St. Patrick Hospital administrators would need to work closely with key physicians

to get specialists organized into groups as part of any effort to develop a PLM approach to cardiology.

Many healthcare professionals are in a state of denial when it comes to the significant effect healthcare reform will have on their lives. However, many others have accepted the change and are positioning themselves for success in the changing marketplace. In light of the degree of change in the healthcare environment expected by many physicians, St. Patrick Hospital should not experience a prohibitively high level of physician resistance to a product line approach. In order to insure success however, physicians would need to play a key role in the transition to a product line emphasis.

E. INFORMATION SYSTEMS

In many ways, St. Patrick Hospital is positioned on the leading edge of technology in terms of information systems. The hospital uses HBO & Company of Atlanta, Georgia for its main patient care and financial system. HBO is an industry leader in healthcare and has developed or is the process of developing sophisticated systems to respond to the changes in the healthcare environment. St. Patrick Hospital has a close working relationship with HBO, including being a development site for new software releases.

The information systems at the hospital are well integrated and employ "open-architecture" technology in a local area network which is expandable to a wide area network. Open-architecture allows for several proprietary software applications to run on a single hardware platform. Network capability allows several users access to information. A wide area network would allow physicians and other off-site healthcare providers to access information as well.

The computer systems at St. Patrick Hospital capture the information necessary to support PLM. The shortcomings of the information systems appear to be in the area of getting timely access to relevant information in a format useful for decision making. The hospital has been considering acquiring decision-support software offered by HBO that would put information at

the fingertips of managers in a user-friendly manner. The cost of the software would be approximately $250,000. Due to the hospital's degree of sophistication in information systems, the additional investment required to provide the information necessary to support PLM would not be prohibitive.

The hospital does not yet have in place a sophisticated cost accounting system. In the interim, it is possible to make reasonable estimates of the cost of specific procedures by combining the information on departmental charges from the HBO system with the department specific ratios of cost to charges that come from the "step-down" process of the Medicare Cost Report. The step-down process allocates the cost of each overhead department to each revenue department by a department-specific allocation statistic. For example, plant maintenance cost would be allocated based on square footage, and communication cost would be allocated by number of telephone extensions. Total departmental costs for each revenue department, including all direct and allocated costs, are divided by total departmental charges to arrive at a ratio of costs to charges. Applying this ratio to specific departmental charges results in an approximation of the cost to provide the service.

In summary, St. Patrick Hospital does not have a significant weakness in terms of traditional information

systems. The hospital has made a significant investment in information technologies. However, the hospital would need to invest additional money and time developing or acquiring a more sophisticated cost accounting system to provide the type of information needed to support PLM.

F. NETWORKS AND CRITICAL PATHS

St. Patrick Hospital has been the primary catalyst for the formation of the Northern Rockies Healthcare Network. The network consists of 25 hospitals located in Western Montana and Northern Idaho with St. Patrick Hospital as the hub. Other hospitals in the network are typically small, primary care institutions. St. Patrick provides educational opportunities and receives improved referral patterns for specialty care services in return.

Networking activity further enhances the importance for managing services in a cross-functional way. As the network moves from a loose affiliation to an integrated network, coordination of the management of product lines becomes much more important. As the self interests of the network members become merged, it will benefit all members to have product lines managed as efficiently as possible. In the desire to contain technology, networks would decide which technologies to buy (from other networks), and which to produce. Those specialty services that are produced would need to be managed in a high quality/low cost manner to compete effectively with other providers. The result would be to form network-wide product lines that could be marketed as specialty services to other integrated networks.

The concept of networking is closely tied in with healthcare reform and the increasing importance of integrated health delivery systems. The importance for PLM is that St. Patrick Hospital is actively involved in networking and is taking the first steps in evaluating an integrated delivery system. Consequently, St. Patrick is making the transition from the traditional, fragmented way of viewing the provision of healthcare. The changes in healthcare delivery will require that the hospital manage its services in a cross-functional manner.

St. Patrick Hospital is also actively involved with the development of critical paths for specific services. The importance of this concept is that it helps overcome the barrier of resistance to standardization. Healthcare professionals have historically been resistant to standardized treatment patterns for patients. Critical paths have demonstrated at St. Patrick Hospital that standardization in health delivery can lead to higher quality and lower cost.

The concept of critical paths is roughly equivalent to product lines. Critical paths are created for specific diagnostic categories, which for hospitals can be defined as product lines. In order to be able to monitor or control cost and quality of a product line, it would be helpful to examine the critical path to determine the clinical steps that took

place over the course of the patient's stay. In a sense, the development of critical paths for specific diagnoses is a first step in the transition to a cross-functional product line approach to healthcare delivery.

G. HEALTHCARE REFORM

Perhaps the most important issue driving hospitals and physicians to re-evaluate the manner in which healthcare is provided is the impending change in the healthcare system. The coordination difficulties that have traditionally been part of the hospital environment are likely to be overshadowed by reform efforts.

St. Patrick Hospital is responding to expected changes in the healthcare delivery system in a proactive manner. The hospital is looking into the possibility of forming the integrated provider network that would provide health services to the population of Western Montana. The challenge of a provider group would be to coordinate the array of services required by patients from pre-hospital services, in-patient hospital care, to post-hospital care. The coordination required to successfully provide a seamless system would perhaps be more of a challenge than coordinating functional services within the hospital. Achieving the required level of coordination of services will likely require some form of PLM. Further, the implementation of healthcare reform will serve to break down the traditional barriers between hospital specialties and assist in the transition to a product line emphasis.

H. RECOMMENDATION FOR ST. PATRICK HOSPITAL

St. Patrick Hospital appears to be well positioned to respond to the dramatic changes in the environment. The hospital has taken significant steps, such as the development of critical paths, healthcare networks, and the implementation of CQI which have laid much of the groundwork necessary for a further transition in the provision of healthcare services. Product Line Management would be the next logical step in the required transition of healthcare delivery for St. Patrick Hospital. The concept of managing services in a cross-functional way is consistent with other efforts at organizational change being implemented at the hospital. Further, healthcare reform may necessitate a product line emphasis for the hospital to be a high-quality, low-cost provider of services. A cross-functional approach to managing services may be required for survival in the changing healthcare environment.

For these reasons, it would not only be feasible, but may also be necessary for St. Patrick Hospital to adopt many of the elements of a PLM system. St. Patrick has made the decision to approach cardiac services as a coordinated "Center of Excellence" and is working with key physicians to develop a high quality and cost effective cardiac surgery program to compete on a regional, if not national, scale. The hospital

would need to develop a management structure (PLM) to support such a concept.

It is not recommended that St. Patrick Hospital attempt to adopt the PLM model discussed in the literature and described in the first part of this paper. The literature describes a PLM system involving a Product Manager with decision-making authority over several functional departments. This model also advocates a matrix management model that has not worked well in hospitals due to the confusion created in reporting relationships. The industry model of PLM is one that should not be attempted in a hospital setting without significant modifications. The reality of the hospital environment is that there exist several highly specialized clinical departments and medical specialties that can not be properly managed by a single person.

The PLM model a hospital selects must be tailored to the unique characteristics of the institution. For St. Patrick Hospital, a PLM model that utilizes a facilitator, as opposed to a product manager, would be consistent with the changing structure and culture of the organization. The role of the facilitator would be to serve as a "product champion" for a product line and to get functional departments working closely together for the overall benefit of the product line and the organization. The facilitator would be responsible for

monitoring financial and clinical performance of the product line and reporting directly to senior management. Such an approach, combined with improved information reporting systems and a coordinated marketing effort, would likely provide a framework for the long-term success of the hospital.

St. Patrick Hospital does not appear to have significant limitations in terms of internal resources required for a transition to PLM. The hospital is well positioned in terms of information systems and organizational structure. Physician resistance, if properly managed, does not appear to be a limitation. Further, The hospital is fortunate to have a highly motivated and talented pool of personnel from which to select product line facilitators. The hospital would still need to invest in management training in order to assure that product facilitators had the technical background in the product line, along with the management skills to successfully administer to the product line.

It would be prudent for the hospital to move slowly in any attempt to implement a product line focus. It may be beneficial to start with one product line; namely cardiac care. It may be helpful to further narrow the product line down to specific cardiac diagnoses. St. Patrick Hospital should use a team approach because this emphasis is consistent with the direction the organization is headed in terms of consensus-based decision making.

I. CONCLUSION

In order to control costs, many hospitals adopted a budget and control strategic orientation which evolved out of the prospective payment system and the need to determine gains and losses of DRGs. After implementing this strategy, many hospitals still found it difficult to significantly impact the costs of care as there was no one person or team responsible for the entire continuum of care received by any patient [5].

Further, consumers are now being offered a range of health care alternatives to the traditional hospital setting. While consumers are demanding more responsive programs, hospitals have historically provided slow response [21]. Hospitals are increasingly asked to be both cost competitive and market driven. These two goals can conflict. PLM offers a solution to this dilemma [21].

The provision of healthcare has traditionally been viewed as highly personal in its nature and not well suited for standardization. Some argue that every case is unique and deserving of individual attention. The concept of grouping patients into "product lines" may be perceived by some as an assembly line approach that may adversely impact hospital quality. Acceptance of PLM will depend on the realization that the process of standardization, which has proved successful in improving efficiency and quality in the

manufacturing process, can prove to be equally successful in hospitals [6]. While the product line concept is one borrowed from other industries, with necessary modifications it still can provide a meaningful framework for defining and managing the activities of a hospital [15]. St. Patrick Hospital stands to benefit from a cross-functional approach to managing product lines for improved quality and profitability.

J. OPPORTUNITIES FOR FURTHER RESEARCH

The existing literature is lacking research which attempts to quantify the financial impact of the implementation of a PLM system. All the surveys referred to were qualitative in nature and did not lend themselves to empirical analysis. It would be useful to review the financial effects of the implementation of PLM systems in other hospitals.

For example, if St. Patrick Hospital were to implement a PLM system for cardiac care, what range of cost savings or quality improvement could be expected? If a financial estimate could be made of the percentage efficiency improvement experienced by other hospitals, St. Patrick could apply that percentage to the estimated $20 million (hospital cost) of cardiac services provided annually to arrive at a range of potential cost savings. The hospital would then be in a better position to justify the investment in information systems, organizational structure changes, and additional management time that would be required to successfully implement the change.

Specifically, research should be completed on hospitals that have implemented a PLM structure. The average cost per case before the implementation of a PLM system could then be compared to the average per case cost after implementation to

determine a range of total cost savings. Also, outcomes (usually measured in terms of mortality rates) could be examined before and after implementation of PLM to arrive at an estimate of the changes in service quality that could be attributed to a PLM strategy.

Market share and PLM would also be important topics for additional research. By measuring the changes in market share that could be attributed to the implementation of a PLM system, a hospital would be better able to determine the amount of marketing resources to be devoted to a particular product line. This could be accomplished by studying hospitals in a comparable market setting that implemented a PLM system and measuring the market share of the product line over time.

EXHIBIT A
SUMMARY OF MAJOR DIAGNOSTIC CATEGORIES
ST. PATRICK HOSPITAL
TOP 17 MDCs
YEAR-TO-DATE 10-31-93

CODE	DESCRIPTION	TOTAL CHARGES	# OF PATIENTS
5	Diseases/Disorders of the Circulatory System	23,396,671	1,678
8	Diseases/Disorders of the Musculoskeletal System	8,169,347	1,190
4	Diseases/Disorders of the Respiratory System	4,165,540	533
6	Diseases/Disorders of the Digestive System	3,808,058	584
19	Mental Diseases and Disorders	2,653,785	584
1	Diseases/Disorders of the Nervous System	2,492,069	391
7	Diseases/Disorders of the Hepatobiliary System & Pancreas	1,366,527	211
11	Diseases/Disorders of the Kidney and Urinary Tract	1,182,186	212
20	Substance Use and Abuse	1,165,978	237
18	Infectious & Parasitic Diseases	896,202	97
17	Myeloproliferative Diseases	894,607	104
21	Injuries & Toxic Effects of Drugs	859,197	128
12	Diseases/Disorders of the Male Reproductive System	740,085	142
13	Diseases/Disorders of the Female Reproductive System	609,104	140
10	Endocrine, Nutritional, & Metabolic	574,647	136
9	Diseases/Disorders of the Skin	551,556	140
24	Multiple Significant Trauma	465,332	22

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